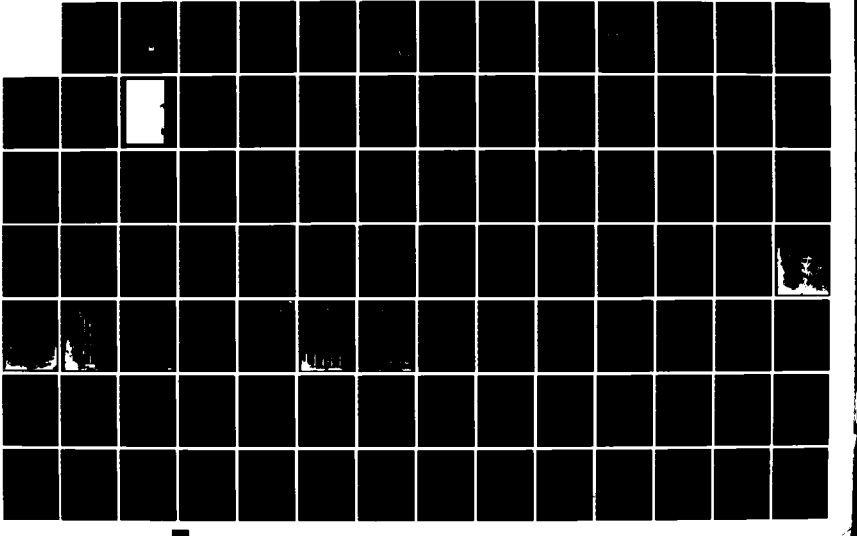
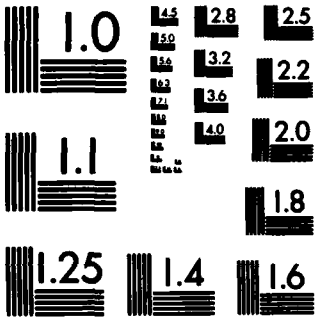
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HOUSATONIC RIVER BASIN

NORFOLK, CONNECTICUT

AD-A144 566

NORFOLK BROOK DAM
CT 00485

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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4. TITLE (and Subtitle) Norfolk Brook Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Housatonic River Basin
Norfolk, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Norflok Brook Dam and Dike form a single purpose flood control impoundment. The dam consists of a zoned earth embankment with a maximum height off 43 feet, a top width of 14 feet, an upstream slope of 3 horizontal to 1 vertical and a downstream slope of 2 horizontal to 1 vertical.Based on the visual inspection and a review of all available pertinent data, the condition of the dam is judged to be fair. The dam is classified as "Intermediate" in size with a "High" hazard potential. A test flood equal to the PMF was used to evaluate the spillway capacity.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

JUN 10 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Norfolk Brook Dam (CT-00485) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the owner and cooperating agency for the State of Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

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As stated

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NORFOLK BROOK DAM
CT 00485



HOUSATONIC RIVER BASIN
NORFOLK, CONNECTICUT

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00485

NAME OF DAM: Norfolk Brook Dam

TOWN: Norfolk

COUNTY AND STATE: Litchfield County, Connecticut

STREAM: Norfolk Brook

DATE OF INSPECTION: November 17, 1980; February 11, 1981

BRIEF ASSESSMENT

The Norfolk Brook Dam and Dike form a single purpose flood control impoundment. The dam consists of a zoned earth embankment with a maximum height of 43 feet, a top width of 14 feet, an upstream slope of 3 horizontal to 1 vertical and a downstream slope of 2 horizontal to 1 vertical. The dam is 440 feet long and has a grass-covered 80-foot emergency spillway excavated into natural ground between the dam and dike. The principal spillway is of the drop inlet type and discharges through a 30-inch conduit through the center of the dam. The dam, constructed on a pervious foundation, has a central impervious core, and a drainage system under the downstream portion of the embankment. The dike consists of a zoned earth embankment of the same cross section as the dam. The dike has a maximum height of 28 feet and a length of 270 feet. As the impoundment is used for flood control, it remains empty except during periods of heavy runoff. The impoundment has a maximum storage capacity of 730 Acre-Feet.

Based on the visual inspection and a review of all available pertinent data, the condition of the dam is judged to be fair.

The impoundment has never been filled so the behavior of the structure under full hydrostatic loading conditions is unknown. The future integrity of the dam could be affected by a lack of good grass cover on the spillway and embankment slopes and riprap slope protection at the plunge pool for the outlet of the principal spillway.

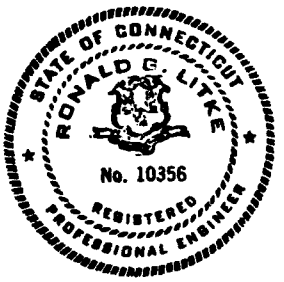
Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as "Intermediate" in size with a "High" hazard potential. A Test Flood equal to the Probable Maximum Flood (PMF) was used to evaluate the spillway capacity. The Test Flood inflow of 3,100 cubic feet per second (cfs) as contained in the Soil Conservation Service Design Report was routed through the impoundment and produced an outflow of about 1,400 cfs. The spillway capacity with the water level at the top of the dam is about 1,870 cfs, 134 percent of the routed Test Flood outflow. The Test Flood would leave a freeboard of 0.6 feet.

It is recommended that a qualified, registered engineer be retained to design riprap protection for the plunge pool and to inspect the dam during each period of significant flood impoundment. In addition, the grass cover should be restored and properly maintained on the emergency spillway and embankment slopes. The Soil Conservation Service's Operations and Maintenance Handbook should be provided to the dam's operator, records of water levels should be kept, and a downstream warning system should be developed and put into effect.

The owner should implement these recommendations as described herein and in greater detail in Section 7 of the Report within one year after receipt of this Phase I Inspection Report, with the exception of establishing a good grass cover on the emergency spillway, which should be initiated immediately.

Ronald G. Litke, P.E.
Project Engineer

Roald Haestad
President







This Phase I Inspection Report on Norfolk Brook Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Geotechmical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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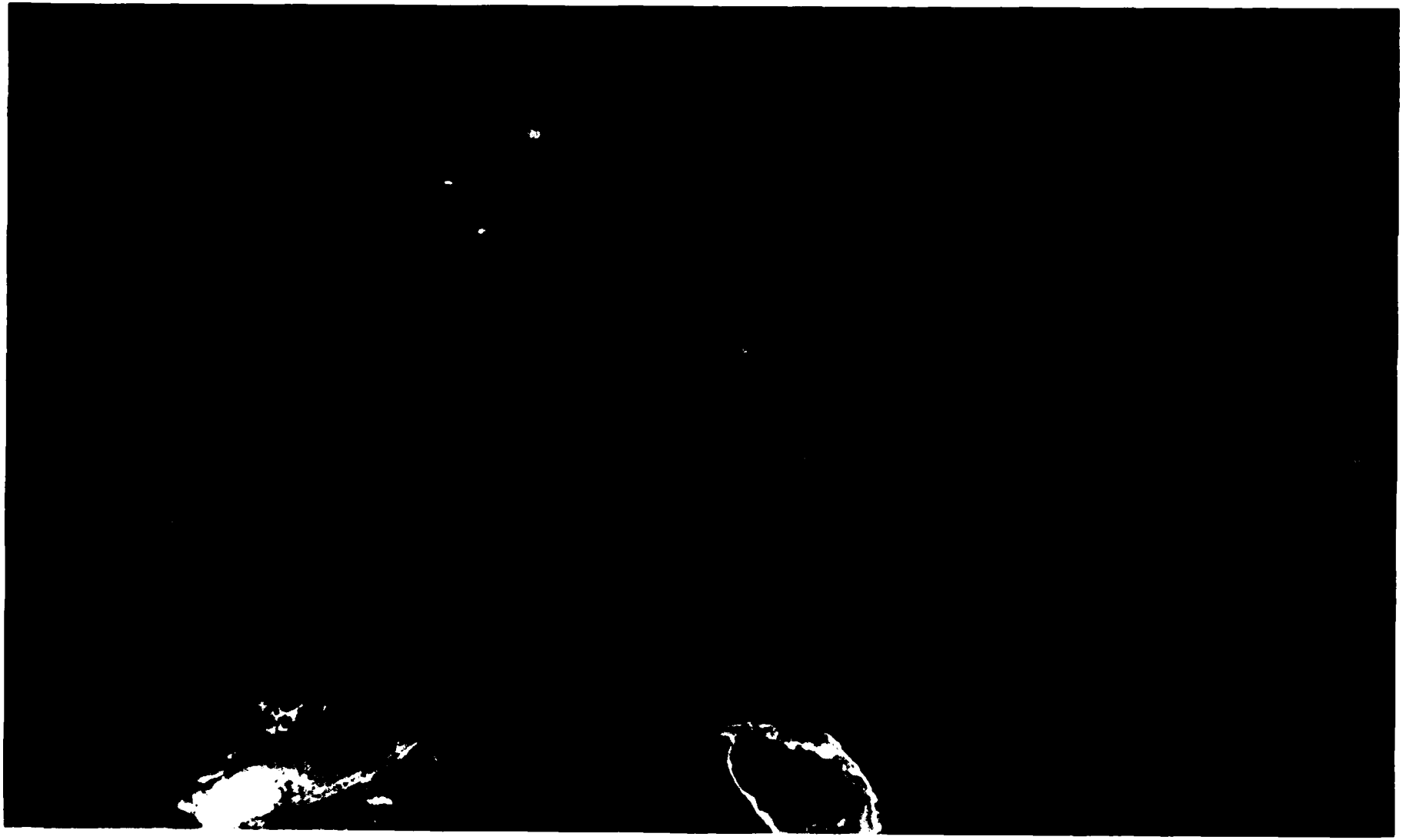
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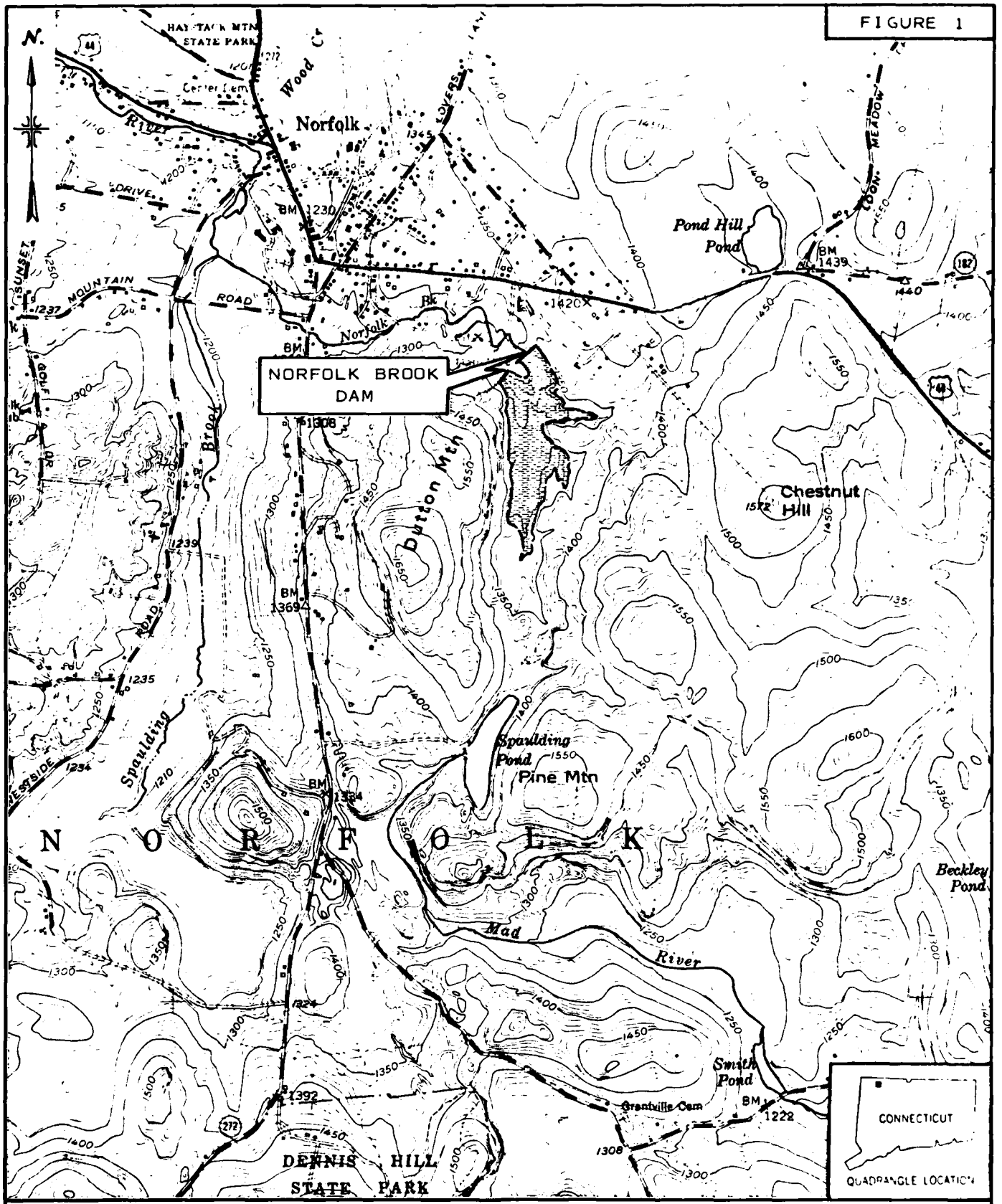
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OVERVIEW PHOTO

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM - CT 00485
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		NORFOLK BROOK
		NORFOLK, CONNECTICUT 13 NOVEMBER 1980

FIGURE 1



LOCATION PLAN

NORFOLK BROOK DAM
NORFOLK, CONNECTICUT

ROALD HAESTAD, INC. SCALE: 1" = 2000' NORFOLK QUADRANGLE 1969

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

NORFOLK BROOK DAM

PROJECT INFORMATION
SECTION 1

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Roald Haestad, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Roald Haestad, Inc. under a letter of October 28, 1980, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-0005 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The Norfolk Brook Dam also known as Blackberry River Watershed Floodwater Retarding Dam No. 6, is located on the Norfolk Brook, about 1.4 miles upstream of the confluence with the Blackberry River, approximately 3,000 feet east of Connecticut Route 272 and 1,500 feet south of U.S. Route 44, in the Town of Norfolk, Connecticut. The dam is shown on the Norfolk U.S.G.S. Quadrangle map having coordinates of latitude N41° 59.1', and longitude W73° 11.3'.

b. Description of Dam and Appurtenances

The Norfolk Brook Dam is a flood retarding structure which remains empty except during periods of heavy runoff. The dam consists of a 440 foot long compacted earth embankment with a principal drop inlet type spillway located near the center of the dam. At the left end of the dam an 80 foot wide emergency spillway has been excavated into the original ground. A 270 foot long earth dike is located immediately to the left of the emergency spillway.

The dam is constructed on a pervious foundation and has a maximum height of 43 feet, a top width of 14 feet, an upstream slope of 3 horizontal to 1 vertical, and a downstream slope of 2 horizontal to 1 vertical for the upper portion, changing to 3-1/2 horizontal to 1 vertical 15 feet above the toe.

The embankment is comprised of two zones, a central impervious zone composed of silty sands with silts, and upstream and downstream pervious zones composed of sands and gravels. Plans indicate a filter drain was constructed under the downstream embankment from the downstream edge of the impervious zone to the toe.

The drain extends as much as 10 feet below the foundation of the central impervious zone.

The dike has a maximum height of 28 feet and the same cross section as the dam, except that the downstream slope remains constant at 2 horizontal to 1 vertical.

The principal spillway consists of a reinforced concrete drop inlet structure and a conduit through the center of the dam. The drop inlet structure has 7.5 foot long overflow weirs on the left and right sides and a 15-inch slide gate for discharging normal stream flow on the upstream side. The conduit through the dam is a 30-inch prestressed concrete steel cylinder pipe supported by a concrete cradle reportedly constructed on 4 feet of fill.

The emergency spillway is 80 feet wide with side slopes of 3 horizontal to 1 vertical, a level control section with a profile length of 85 feet and a discharge channel slope of 3 percent. The crest of the dam is 33 feet above the drop inlet spillway crest and 4 feet above the emergency spillway level.

c. Size Classification - "Intermediate"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Intermediate" in size if the height is between 40 feet and 100 feet or the dam impounds between 1,000 Acre-Feet and 50,000 Acre-Feet. The Norfolk Brook Dam has a maximum height of 43 feet and a maximum storage capacity is 730 Acre-Feet. Therefore, the dam is classified as "Intermediate" in size based on height.

d. Hazard Classification - "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for the

dam is "High". A dam failure analysis indicates that a breach of the Norfolk Brook Dam could result in the loss of more than a few lives and economic loss due to downstream flooding of homes, highways and commercial businesses.

The calculated dam breach would release about 40,000 cfs into the Norfolk Brook. Approximately 3,000 feet downstream of the dam an abandoned railroad embankment would obstruct the downstream discharge and cause the floodwaters to pond upstream, inundating about 5 homes up to a depth of 5 feet. Downstream of the railroad embankment the flood waters would overtop U.S. Route 272 by 17 feet. Further downstream several residential homes and a few commercial structures would be flooded to a depth of 2 to 10 feet.

The maximum project discharge capacity, prior to dam breach, would overtop Route 272 by about 2-1/2 feet but would not flood any homes.

e. Ownership

The State of Connecticut
Department of Environmental Protection
Water and Related Resources
State Office Building
Hartford, Connecticut 06115

Benjamin Warner, Director of Water Resources
(203) 566-7220

f. Operator

Anthony Cantele
P.O. Box 161
Pleasant Valley, Connecticut 06063
(203) 379-0771

g. Purpose of Dam

The dam is a single purpose structure designed to provide flood protection to the Blackberry River flood plain.

h. Design and Construction History

The dam was designed in 1961 by the Soil Conservation Service, U.S. Department of Agriculture, for the State of Connecticut. The dam was designed to contain a Hurricane "Diane" type storm (1955) without emergency spillway flow. The dam was constructed in 1964 - 1966 by Arthur Hebert Construction Company under the supervision of the Soil Conservation Service.

i. Normal Operational Procedures

The site is reportedly visited by employees of the State Department of Environmental Protection during periods of heavy runoff. The DEP Office in Hartford would be contacted if any problems were noted. No measurements have been taken or records kept of past impoundment depths. The impoundment has never been substantially filled.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 1.0 square mile of essentially undeveloped wooded and "mountainous" terrain.

b. Discharge at Damsite

Discharge at the damsite is through a principal spillway composed of a single stage reinforced concrete riser with a 30-inch diameter conduit, and over a grassed emergency spillway located between the main dam and the dike.

1.	Outlet Works (conduits) Size:	30-inch
	Invert Elevation:	1299.0
	Discharge Capacity:	127 cfs @ El. 1337.0
2.	Maximum Known Flood at Damsite:	Unknown
3.	Ungated Spillway Capacity * at Top of Dam:	1865 cfs
	Elevation:	1337.0
4.	Ungated Spillway Capacity * at Test Flood Elevation:	1400 cfs
	Elevation:	1336.4
5.	Gated Spillway Capacity at Normal Pool Elevation:	N/A
	Elevation:	
6.	Gated Spillway Capacity at Test Flood Elevation:	N/A
	Elevation:	
7.	Total Spillway Capacity * at Test Flood Elevation:	1400 cfs
	Elevation:	1336.4
8.	Total Project Discharge* at Top of Dam:	1865 cfs
	Elevation:	1337.0
9.	Total Project Discharge* at Test Flood Elevation:	1400
	Elevation:	1336.4

*Includes Emergency Spillway flow

c. Elevation - Feet Above Mean Sea Level (NGVD)

1.	Streambed at Toe of Dam:	1294
2.	Bottom of Cutoff:	1288
3.	Maximum Tailwater:	N/A
4.	Normal Pool:	1299.0
5.	Full Flood Control Pool:	1333.0
6.	Spillway Crest:	1304.0 Principal Spillway 1333.0 Emergency Spillway
7.	Design Surcharge - Original Design:	1334.6
8.	Top of Dam:	1337.0
9.	Test Flood Surcharge:	1336.4

d. Reservoir - Length in Feet

1.	Normal Pool:	0 feet
2.	Flood Control Pool:	3,500 feet
3.	Spillway Crest Pool: *	450 feet
4.	Top of Dam:	3,700 feet
5.	Test Flood Pool:	3,600 feet

e. Storage - Acre-feet

1.	Normal Pool:	0 Acre-Feet
2.	Flood Control Pool:	513 Acre-Feet
3.	Spillway Crest Pool: *	3.5 Acre-Feet
4.	Top of Dam:	730 Acre-Feet
5.	Test Flood Pool:	690 Acre-Feet

f. Reservoir Surface - Acres

1.	Normal Pool:	0 Acres
2.	Flood-Control Pool:	49.4 Acres
3.	Spillway Crest:*	1.6 Acres
4.	Test Flood Pool:	58.5 Acres
5.	Top of Dam:	59.6 Acres

*Principal Spillway level

g. Dam

	DAM	DIKE
1. Type:	Zoned Compacted Earthfill	Zoned Compacted Earthfill
2. Length:	440 feet	270 feet
3. Height:	43 feet	28 feet
4. Top Width:	14 feet	14 feet
5. Side Slopes:	U.S.: 3 Hor. to 1 Ver. D.S.: 2 Hor. to 1 Ver.	U.S.: 3 Hor. to 1 Ver. D.S.: 2 Hor. to 1 Ver.
6. Zoning:	Impervious core, shells of sands and gravels	Impervious core, shells of sands and gravels
7. Impervious Core:	Silty sands and silts U.S.: 1.5 Hor. to 1 Ver. D.S.: 1 Hor. to 1 Ver.	Silty sands and silts U.S.: 1.5 Hor. to 1 Ver. D.S.: 1 Hor. to 1 Ver.
8. Cutoff:	N/A	N/A
9. Grout Curtain:	N/A	N/A
10. Other:	Filter drains under the downstream embankment	Filter drains under the downstream embankment

h. Diversion and Regulating Tunnel - N/A

i. Spillway	EMERGENCY SPILLWAY	PRINCIPAL SPILLWAY
1. Type:	Grassed	Concrete weir
2. Length of Weir:	80 feet	15 feet
3. Crest Elevation with Flashboards:	N/A	N/A
without Flashboards:	1333.0	1304.0
4. Gates:	N/A	N/A
5. Upstream Channel:	N/A	N/A
6. Downstream Channel:	Grassed 3% slope	Natural stream
7. General:	85 foot level control section	Discharges through 30-inch pipe at toe of dam

j. Regulating Outlets	
1. Invert:	1299.0
2. Size:	15-inch
3. Description:	Orifice in concrete riser
4. Control Mechanism:	15-inch slide gate
5. Other:	At time of inspection slide gate was fully opened.

ENGINEERING DATA
SECTION 2

2.1 Design Data

Available information which was reviewed included the design report, As-Built Plans, specifications, and general correspondence. The dam was designed and constructed under the supervision of the Soil Conservation Service, U.S. Department of Agriculture. The design report was incomplete as it did not contain emergency spillway design outflow hydrographs. The design report did contain a geologic report, boring logs, a soil report and hydraulic/hydrologic computations.

2.2 Construction Data

As-Built Plans with changes from the original design noted were available and reviewed. Contract records including change orders, photographs and soil test results are reported to be stored at the Federal Archives and Record Center, but were not available for review.

2.3 Operational Data

The site is visited during periods of heavy runoff, but no depth readings are made or records kept.

2.4 Evaluation of Data

a. Availability

Existing data are available at the Soil Conservation Service, U.S. Department of Agriculture, Storrs, Connecticut, the Federal Archives and Record Center, Waltham, Massachusetts, and at the Department of Environmental Protection, Hartford, Connecticut.

b. Adequacy

The information which was available, along with the visual inspection and the hydraulic/hydrologic calculations made for this report, were not adequate to assess the condition of the dam. As the impoundment has never been filled and the dam has never been observed under full hydrostatic load, no comments on the performance of the dam under such loading can be made.

c. Validity

The field inspection indicated that the dam was constructed substantially as shown on the As-Built Plans, except that the 8 inches of top soil to be placed on the emergency spillway was not observed.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspections of the dam and dike were conducted on November 17, 1980 and February 11, 1981. At the times of inspection the 15-inch sediment gate was open. On November 17 the impoundment was completely drained. The February 11 inspection was made during a heavy rainstorm and the impoundment was 4.4 feet above the invert of the principal spillway. The general condition of the dam and the dike at the times of inspection was fair.

Both the dam and the dike consist of compacted earth embankments. The principal spillway is a drop inlet structure located near the center of the dam and discharging through a 30-inch pipe at the downstream toe. An emergency spillway is excavated into natural ground between the dam and the dike.

b. Dam

The slopes of the dam are covered with a mixture of weeds and grass with briers at the downstream toe, Photos 1, 2 and 3. The slopes appear even with no indication of movement or sloughing. The downstream toe of the dam and the foundation drains are protected by a layer of riprap, Photos 1 and 4. The foundation drains under the downstream embankment discharge through two 12-inch corrugated metal pipes alongside the principal spillway outlet pipe, Photo 5. The outlet ends of the pipes were under water. No flow was observed coming from the drains, but rust-colored floccules were present near the pipes.

c. Dike

The dike is overgrown with weeds and briers with some grass, Photos 6 and 7. No indications of movement or sloughing were observed. There is riprap protection along the downstream toe of the dike similar to the dam. The foundation drains under the downstream portion of the dike discharge through a 12-inch corrugated metal pipe below the toe, Photo 8. There was no flow at the times of inspection.

d. Appurtenant Structures

The appurtenant structures consist of the principal spillway and outlet works, and the emergency spillway. The inlet structure is a reinforced concrete drop inlet with a 15-inch slide gate for draining the sediment pond, Photos 9 and 10. The gate appears to be operational. The slide gate is protected by a painted steel trash rack which is beginning to rust. The drop inlet is protected by a galvanized steel pipe trash rack. The concrete was in good condition with no cracking or spalling noted.

The inlet structure discharges through a 30-inch prestressed concrete steel cylinder pipe to a plunge pool at the downstream toe of the dam, Photo 5. Only the downstream end of the outlet pipe was observed. The plunge pool was not riprapped and erosion of the sides was noted, Photo 5.

The 80 foot emergency spillway section is excavated into natural ground between the dam and the dike, Photos 11 and 12. The surface of the spillway is mostly loose sand with no noticable topsoil. Moss is the predominant surface cover on both the spillway

and the side slopes, Photos 12 and 13. Tire ruts were also noted in the spillway.

e. Reservoir Area

No indications of instability were observed along the edges of the reservoir in the vicinity of the dam.

f. Downstream Channel

The channel downstream of the plunge pool enters a natural stream with overhanging trees, Photo 14. Approximately 400 feet downstream the stream crosses under the access road to the dam and enters an open school yard, Photo 15. Vehicle access to the dam would be blocked during high flows. The access road is not maintained in the winter.

3.2 Evaluation

On the basis of the visual inspections, the dam and dike are judged to be in fair condition. The following conditions could affect the future integrity of the structures:

1. The present surface cover on the emergency spillway could lead to erosion and a breach of the dam.
2. Lack of riprap protection at the plunge pool could cause erosion of the toe of the embankment.
3. Failure to maintain the slopes of the dam and dike by topsoiling, seeding and fertilizing to obtain a good grass cover could lead to erosion of the embankment.
4. It should be emphasized that the impoundment has never been substantially filled. Therefore, no observations have been made as to seepage through the dam or its behavior under full hydrostatic loading conditions.

4.1 Operational Procedures

a. General

The Norfolk Brook Dam and Dike form a single purpose flood control impoundment which remains empty except for periods of heavy runoff. Except for a 15-inch slide gate to discharge normal stream flows, the dam has no operating facilities. Both the drop inlet on the principal spillway and the emergency spillway operate without human assistance. The dam is inspected annually by representatives of the Connecticut Department of Environmental Protection and engineers from the Soil Conservation Service. (See Inspection Report, Appendix B, page B-56.)

b. Description of Any Warning System in Effect

There is no formal warning system in effect. The dam is reportedly monitored by DEP personnel during periods of heavy runoff. Any problems noted would be reported to the Department of Environmental Protection.

4.2 Maintenance Procedures

An Operations and Maintenance Agreement was made between the State of Connecticut and the Soil Conservation Service at the time of construction. An Operations and Maintenance Handbook prepared by the Soil Conservation Service and the Connecticut Department of Environmental Protection for Connecticut watersheds is available from the Soil Conservation Service. The Handbook lists operating procedures and maintenance items to be performed.

DEP personnel report that the embankments are not mowed because of the steep slopes.

4.3 Evaluation

Present operations and maintenance procedures are inadequate, as is evident by the poor surface cover of the embankments and the emergency spillway. The slopes of the embankments and the emergency spillway should be properly topsoiled, seeded and maintained. Copies of the Operations and Maintenance Handbook should be provided to the operators for their implementation.

The annual inspections by representatives of the Soil Conservation Service and the Department of Environmental Protection should continue and their recommendations should be carried out.

A formal warning system should be prepared for the dam and put into effect.

5.1 General

The outlet works at the Norfolk Brook Dam consist of a principal spillway of the drop inlet type located near the center of the main dam and an emergency spillway excavated in natural ground between the main dam and the dike. The principal spillway consists of a single stage reinforced concrete riser and a 30-inch diameter conduit of prestressed concrete steel cylinder pipe. The inlet riser consists of a 2.5 foot by 7.5 foot box with a 15-inch diameter slide gate on the upstream side for draining the sediment pool. At the times of inspection the slide gate was completely opened. The weir and slide gate are both protected with trash racks. The drop inlet connects to a 30-inch outlet conduit which passes through the dam and discharges at the downstream toe.

The emergency spillway is a broad crested earth channel with grassed surface excavated in natural ground between the main dam and dike. The channel is 80 feet wide on the bottom with side slopes of 3 horizontal to 1 vertical. The emergency spillway discharges to the same stream as the principal spillway about 500 feet below the toe of the dike. The capacity of the principal spillway is about 125 cfs at design high water Elev. 1334.6. The emergency spillway has a capacity of about 330 cfs at design high water and 1,740 cfs at the top of the dam Elev. 1337.0. Total project discharge capacity at the top of the dam is 1,865 cfs.

The dam has a watershed of 1.0 square mile of essentially undeveloped wooded terrain. The watershed slopes range from very

steep to moderately steep. There is one small pond in the northern portion of the watershed. Elevations range from 1600 feet at the northeastern corner to 1300 at the dam.

5.2 Design Data

The dam was designed by the Soil Conservation Service for the State of Connecticut. The design report, specifications, and correspondance were available and reviewed.

An emergency spillway flood routing was done using a six-hour storm producing 6.71 inches of runoff (Hurricane Diane, 1955). The storm was routed through the principal spillway to determine the lowest possible elevation of the emergency spillway crest. (No emergency flow for the Hurricane Diane storm.) This was determined to be Elev. 1326.6. The emergency spillway was raised to Elev. 1333.0 to avoid excessive excavation of unusable material.

The design high water elevation was set using the State of Connecticut criteria of a minimum of 15 inches of rainfall for a 6-hour period with a maximum infiltration of 1/4-inch per hour. The storm was routed through the impoundment with the water level initially at the crest of the riser. The design high water elevation was calculated to be 1334.6. A Soil Conservation Service routing was also made to check the top of dam elevation. The routing used 18.8 inches of runoff from a 6 hour storm and reached a maximum elevation of 1336.4. The top of the dam was to be set 2 feet above the design high water elevation or at the SCS flood elevation, whichever was higher. The top of the dam was set at 1337.0.

Inspection of the site showed the emergency spillway channel to have a poor grass cover with moss growing and many bare spots.

The emergency spillway discharge capacity calculations were based on a Manning coefficient of 0.04. The spillway was designed for a velocity of 5.4 feet per second (fps), well below the State of Connecticut's allowable design velocity of 9.0 fps. The existing conditions would produce a lower coefficient and greater velocities. The lack of vegetative cover may lead to erosion.

5.3 Experience Data

The dam is reportedly visited by DEP personnel during periods of heavy runoff but no depth measurements are taken or records kept. The maximum impoundment depth to date is unknown.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "High" hazard potential. The size of the dam is classified as "Intermediate" based on a dam height of 43 feet. According to the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers, the Test Flood should be the Probable Maximum Flood (PMF). A Test Flood analysis was made using the Corps of Engineers' "Estimating Effect of Surcharge Storage on Maximum Probable Discharges" as a comparison to the design report SCS flood routing which is essentially the same as the PMF.

Using the Corps of Engineers' Guide Curve for "mountainous" terrain, and assuming the initial water level to be at the principal spillway level, the Test Flood inflow was calculated to be 2,600 cfs and the routed outflow 850 cfs. The project discharge capacity at the top of the dam was calculated to be 1,865 cfs or

219 percent of the Test Flood routed outflow. As the design report figures are more precise they are used as the Test Flood throughout this Report.

The design report SCS flood routing uses a storm with a 6 hour rainfall of 23.87 inches and 18.8 inches of runoff. The storm produces a peak inflow of 3112 cfs and a routed outflow of 1390 cfs at Elev. 1336.4, leaving a freeboard of 0.6 feet The spillway capacity is equal to 134 percent of the routed outflow.

5.5 Dam Failure Analysis

A dam failure analysis was made using the Corps of Engineers' "Rule of Thumb" guidance. Failure was assumed when the water level reached the Probable Maximum Flood Elevation.

The spillway discharge prior to dam breach was not significant when compared to the dam breach flows, and was not taken into consideration in the flood routings.

The dam breach would release up to 40,300 cfs into the Norfolk Brook below the dam. The flood waters would proceed downstream overtopping an abandoned railroad embankment by 5 feet and Route 272 by 17 feet. See Figure 4, page D-26. The backwater from the railroad embankment would flood about 5 homes up to 5 feet deep. The flood waters would then continue downstream overtopping a small dam on Spaulding Brook by 7 feet. Two hundred feet downstream of the small dam several residential homes and commercial establishments would be flooded from 2 feet to 10 feet deep. The flood waters would join the Blackberry River and flow with an average depth of 8.0 feet. Low lying homes along the river banks would be flooded up to a depth of 2 feet. Prior to dam breach the maximum project

discharge of 1,390 cfs at the Test Flood elevation would overtop Route 272 by 2-1/2 feet and would overtop the small dam on the Spaulding Brook by 1-1/2 feet. The Blackberry River would be able to contain the spillway flow with minor overtopping of the river banks.

The dam is classified as "High" hazard potential. A dam failure could result in the loss of more than a few lives and extensive property damage should the dam fail.

Failure of the dike would affect the same watercourse and, as it is smaller than the dam, separate flood routing was not performed.

EVALUATION OF STRUCTURAL STABILITY

SECTION 6

6.1 Visual Observations

The visual inspection did not disclose any indications of structural instability.

6.2 Design and Construction Data

A design report, As-Built Plans and Specifications were available from the Soil Conservation Service, U.S. Department of Agriculture, Storrs, Connecticut.

The design report includes a discussion of the slope stability computation results but does not provide the actual computations. The design report states the Modified Swedish Circle Method of analysis indicated the need for upstream slopes of 3 horizontal to 1 vertical and downstream slopes of 2-1/2 horizontal to 1 vertical. The Sliding Wedge Analysis for 3:1 upstream slopes and 2:1 downstream slopes gave factors of safety of 2.18 for the upstream section and 2.48 for the downstream section. Another stability analysis known as the Glover - Cornwell Method determined the stable slopes to be 3:1 upstream and 2.5:1 downstream.

The design selected was 3:1 upstream slope with a 10 foot wide berm at Elev. 1304.0, and a downstream slope of 2:1 from the crest to Elev. 1310.0, where the slope flattens to 3-1/2:1. See Appendix B, pages B-46 through B-48.

The dike was designed and constructed without a berm or break in the slope. The analysis appears thorough although the computations were not available.

6.3 Post-Construction Changes

No known post-construction changes have been made.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with the recommended Phase I inspection guidelines does not warrant seismic stability analysis.

ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES
SECTION 7

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection and a review of the available data, the dam is judged to be in fair condition. The future integrity of the dam could be affected by the poor grass cover on the emergency spillway and embankment slopes, and the lack of riprap protection at the plunge pool.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillways are capable of passing 132 percent of the routed Test Flood (PMF) outflow. The dam would have a freeboard of about 0.6 feet with the water level at the Test Flood elevation.

b. Adequacy of Information

The information available was not adequate to assess the condition of the dam. As the impoundment has never been substantially filled, the behavior of the structure under full hydrostatic loading conditions is unknown.

c. Urgency

The recommendations presented in Section 7.2 and 7.3 should be carried out within one year after receipt of this Report by the owner. However, the establishment of a good grass cover on the emergency spillway should be initiated immediately upon receipt of this Report.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified, registered engineer:

1. Riprap protection for the plunge pool should be designed and constructed.
2. As the behavior of the dam under full hydrostatic loading conditions is unknown, the dam should be inspected by a qualified, registered engineer during each period of significant flood impoundment. Especial care should be taken in inspecting the dam when the previous maximum impoundment depth is exceeded.

7.3 Remedial Measures

1. A good stand of grass should be grown on the emergency spillway channel and its side slopes. The area should be topsoiled as required.
2. Brush should be cleared from the dam and dike crest and slopes and from the area within 20 feet of the toes of the dam and dike.
3. A good growth of grass should be restored and maintained on the embankment slopes by topsoiling, fertilizing and reseeding as required.
4. Flood impoundment depth readings should be taken and records kept.
5. The program of annual technical inspections by qualified, registered engineers should be continued.
6. The Soil Conservation Service Operations and Maintenance Handbook should be provided to the operators of the dam.
7. A downstream warning system should be developed and put into effect in case of an emergency at the dam.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Norfolk Brook Dam

DATE: 11/17/80 / 2/11/81* TIME: 1:30 pm / 2:00 pm WEATHER: Cloudy 35° / Rain 60°

W.S. ELEVATION: 1299.1 / 1304.4 U.S. 1295.3 / 1296.5 DN.S

*by DLS

	PARTY	DISCIPLINE
1.	Roald Haestad, P.E. - Roald Haestad, Inc.	Civil/Geotechnical
2.	Donald L. Smith, P.E. - Roald Haestad, Inc.	Civil/Hydrologic
3.	Ronald G. Litke, P.E. - Roald Haestad, Inc.	Civil/Structural
4.		
5.		
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	RH,DLS,RGL	Good; vegetation fair
2.	Dike Embankment	RH,DLS,RGL	Good; vegetation fair
3.	Outlet Works - Intake Channel & Structure	RH,DLS,RGL	Good
4.	Outlet Works - Control Tower	RH,DLS,RGL	Good
5.	Outlet Works - Transition & Conduit	RH,DLS,RGL	Good
6.	Outlet Works - Outlet Structure & Channel	RH,DLS,RGL	Some erosion at plunge pool; no riprap
7.	Outlet Works - Emer. Spillway, Appr. & Dis.Chan.	RH,DLS,RGL	Very poor vegetative cover
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 2/11/81* 11/17/80

PROJECT FEATURE: Dam Embankment NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

*by DLS

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	1337.0
CURRENT POOL ELEVATION	1299.1 (11/17/80); 1304.4 (2/11/81)
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	No pavement
MOVEMENT OR SETTLEMENT OF CREST	None observed
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Good
HORIZONTAL ALIGNMENT	Good
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESPASSING ON SLOPES	None observed
VEGETATION ON SLOPES	Fair; grass and weeds; briers at downstream toe
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	None observed
ROCK SLOPE PROTECTION - RIPRAP FAILURES	Riprap at downstream toe
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE	None observed
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	Foundation drain discharges through two 12-inch cmp along side outlet conduit.
TOE DRAINS	Filter drain behind riprap
INSTRUMENTATION SYSTEM	None

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80

PROJECT FEATURE: Dike Embankment NAME: RH

DISCIPLINE: Civil Engineer NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
CREST ELEVATION	1337.0
CURRENT POOL ELEVATION	Dry
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	None
MOVEMENT OR SETTLEMENT OF CREST	None observed
LATERAL MOVEMENT	None observed
VERTICAL ALIGNMENT	Good
HORIZONTAL ALIGNMENT	Good
CONDITIONS AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	None observed
TRESPASSING ON SLOPES	None observed
VEGETATION ON SLOPES	Fair; grass, weeds and briers
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	None observed
ROCK SLOPE PROTECTION - RIPRAP FAILURE	Riprap on downstream toe
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
UNUSUAL EMBANKMENT OR DOWNSTREAM SEEPAGE	None observed
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	Filter drain behind riprap
TOE DRAINS	12-inch cmp at downstream toe
INSTRUMENTATION SYSTEM	None

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - & Intake Channel Intake Structure NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
A. APPROACH CHANNEL:	Natural stream
SLOPE CONDITIONS	
BOTTOM CONDITIONS	
ROCK SLIDES OR FALLS	
LOG BOOM	N/A
DEBRIS	None observed
CONDITION OF CONCRETE LINING	N/A
DRAINS OR WEEP HOLES	N/A
B. INTAKE STRUCTURE:	
CONDITION OF CONCRETE	Good
STOP LOGS AND SLOTS	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Control Tower NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
A. CONCRETE AND STRUCTURAL:	
GENERAL CONDITION	Good
CONDITION OF JOINTS	Good
SPALLING	None observed
VISIBLE REINFORCING	None observed
RUSTING OR STAINING OF CONCRETE	None observed
ANY SEEPAGE OR EFFLORESCENCE	None observed
JOINT ALIGNMENT	Good
UNUSUAL SEEPAGE OR LEAKS IN GATE CHAMBER	None observed
CRACKS	None observed
RUSTING OR CORROSION OF STEEL	Trash rack rusted
B. MECHANICAL AND ELECTRICAL:	
AIR VENTS	N/A
FLOAT WELLS	N/A
CRANE HOIST	N/A
ELEVATOR	N/A
HYDRAULIC SYSTEM	N/A
SERVICE GATES	15-inch slide gate; good condition
EMERGENCY GATES	N/A
LIGHTNING PROTECTION SYSTEM	N/A
EMERGENCY POWER SYSTEM	N/A
WIRING AND LIGHTING SYSTEM IN GATE CHAMBER	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Transition & Conduit NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
GENERAL CONDITION OF CONCRETE	30-inch prestressed concrete steel cylinder pipe; good condition
RUST OR STAINING ON CONCRETE	None observed
SPALLING	None observed
EROSION OR CAVITATION	None observed
CRACKING	None observed
ALIGNMENT OF MONOLITHS	N/A
ALIGNMENT OF JOINTS	None observed
NUMBERING OF MONOLITHS	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80 2/11/81*

PROJECT FEATURE: Outlet Works - Outlet Structure & Outlet Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS,RGL *by DLS

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
GENERAL CONDITION OF CONCRETE	Concrete pipe; good condition
RUST OR STAINING	None observed
SPALLING	None observed
EROSION OR CAVITATION	None observed
VISIBLE REINFORCING	None observed
ANY SEEPAGE OR EFFLORESCENCE	None observed
CONDITION AT JOINTS	None observed
DRAIN HOLES	None observed
CHANNEL	Plunge pool to natural stream
LOOSE ROCK OR TREES OVERHANGING CHANNEL	Some overhanging trees
CONDITION OF DISCHARGE CHANNEL	Sides of plunge pool eroding

PERIODIC INSPECTION CHECK LIST

PROJECT: Norfolk Brook Dam DATE: 11/17/80

PROJECT FEATURE: Outlet Works - Emer. Spillway, Appr. & Discharge Channel NAME: RH

DISCIPLINE: Civil Engineers NAME: DLS, RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	
GENERAL CONDITION	Good
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF APPROACH CHANNEL	Grassed
B. EMERGENCY SPILLWAY:	
GENERAL CONDITION	Poor
SURFACE	Surface mostly bare, loose sand or moss; little grass
SIDE SLOPES	Poor grass cover; many bare spots
OTHER	
C. DISCHARGE CHANNEL:	
GENERAL CONDITION	Fair; discharges to stream downstream of toe
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	None observed
FLOOR OF CHANNEL	Grassed; poor grass cover; many bare spots
OTHER OBSTRUCTIONS	None observed

APPENDIX B

ENGINEERING DATA

LIST OF REFERENCES

Reference Nos. 1 through 4 are available at the State of Connecticut Department of Environmental Protection, Water and Related Resources Section, State Office Building, Hartford, Connecticut. Reference Nos. 5 through 9 are available from the Soil Conservation Service of the U.S. Department of Agriculture, Mansfield Professional Park, Route 44-A, Storrs, Connecticut. Reference No. 10 is located at the Federal Archives and Record Storage Center, Waltham, Massachusetts.

1. Correspondence file on the Blackberry River Watershed Project, Floodwater Retarding Dam No. 6, Norfolk, Connecticut.

2. Letter to William S. Wise, Director of State Water Resources Commission, from John Mozzochi, reviewing design criteria for Norfolk Brook Site No. 6, July 18, 1961.

3. Construction Specifications, Blackberry River Watershed Protection Project, Detention Reservoir - Site No. 6, Approved October 2, 1961.

4. Operations and Maintenance Inspection Report, State of Connecticut Department of Environmental Protection, August 13, 1979.

5. Design Report, Blackberry River Watershed Site No. 6, Norfolk, Connecticut.

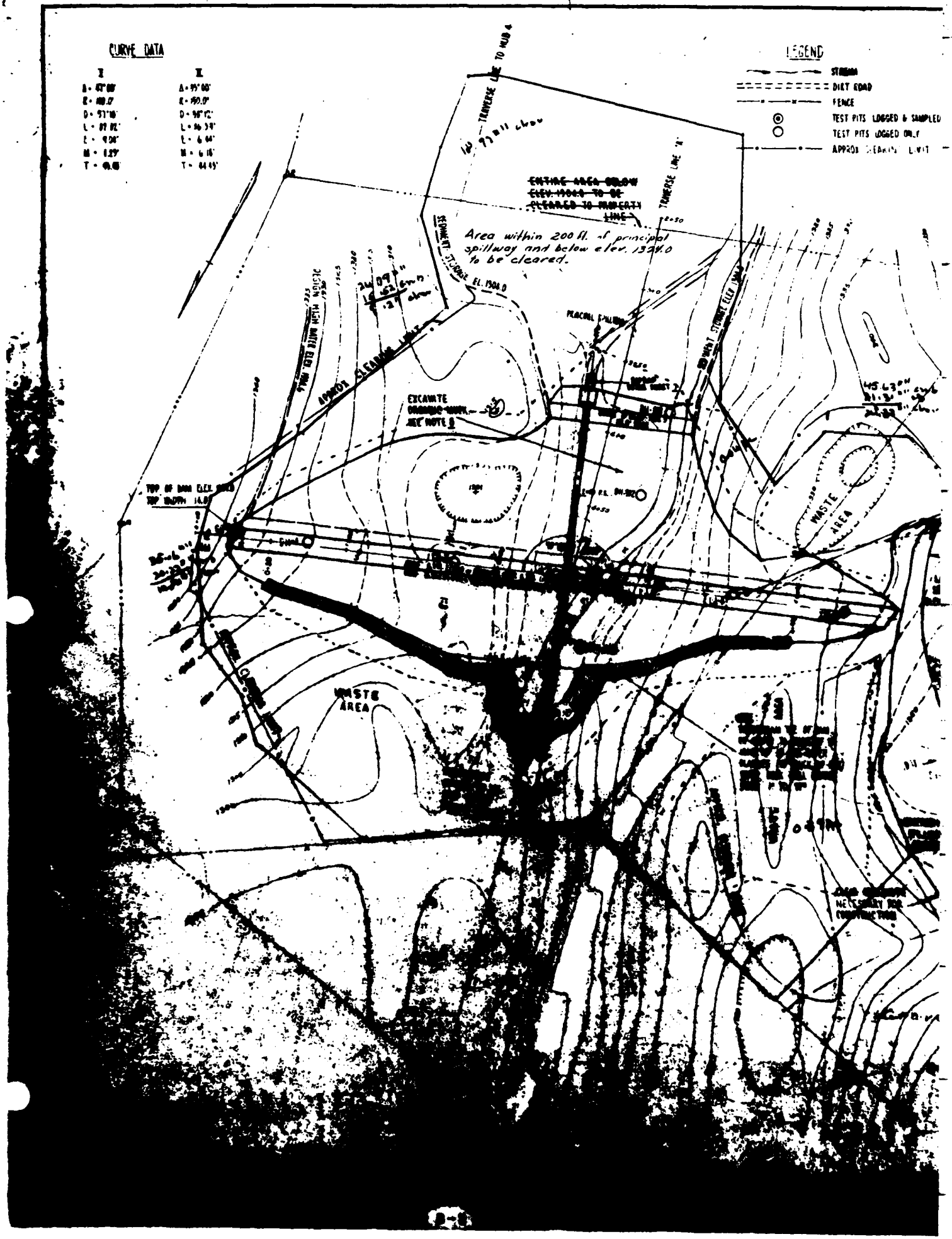
6. Plans for Blackberry River Watershed Project, Floodwater Retarding Site No. 6, Norfolk, Connecticut, October 1962 (Full Size).

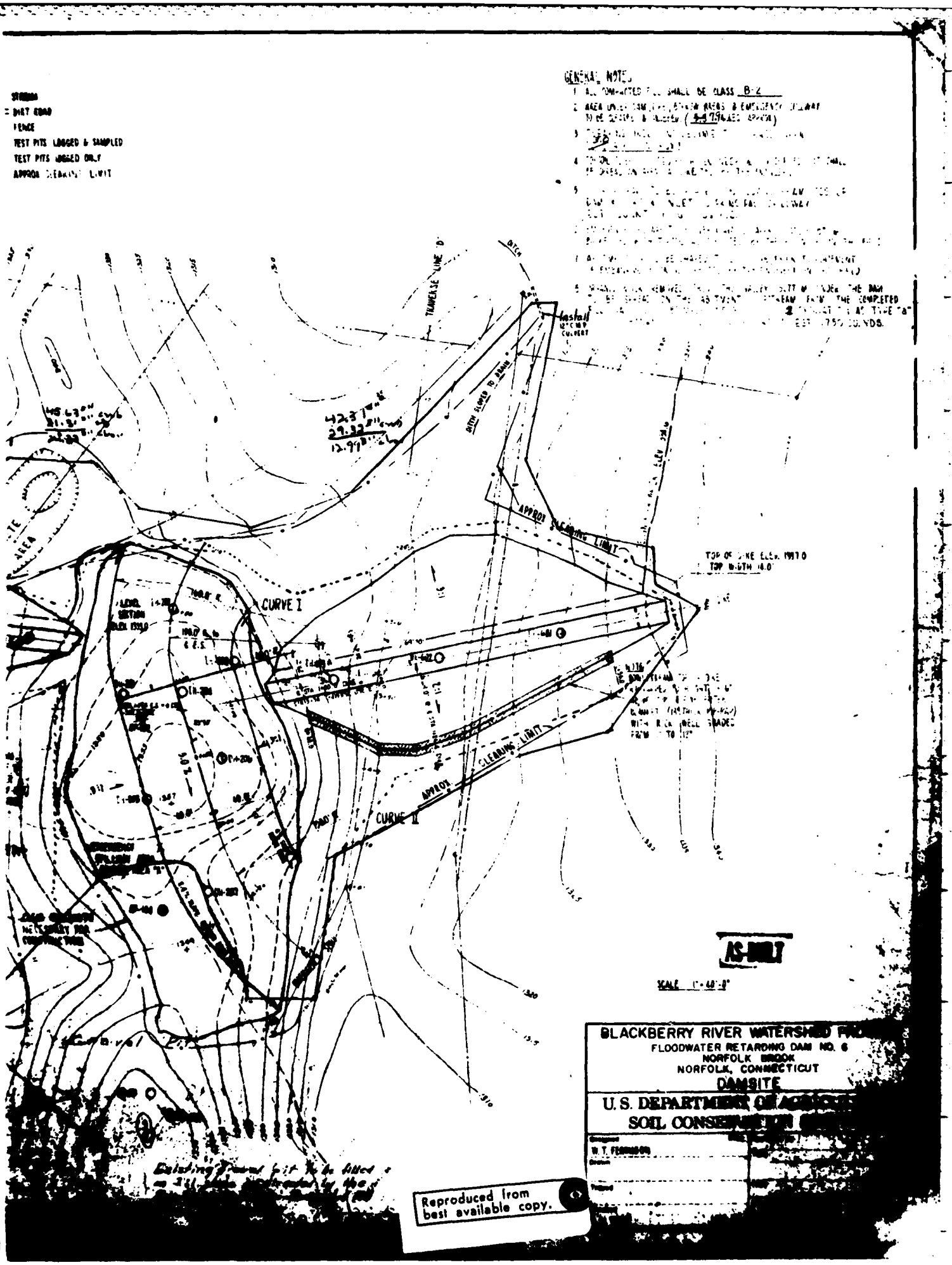
7. "As-Built" Plans for Blackberry River Watershed Project, Floodwater Retarding Site No. 6, Norfolk, Connecticut, 1968 (Half Size).

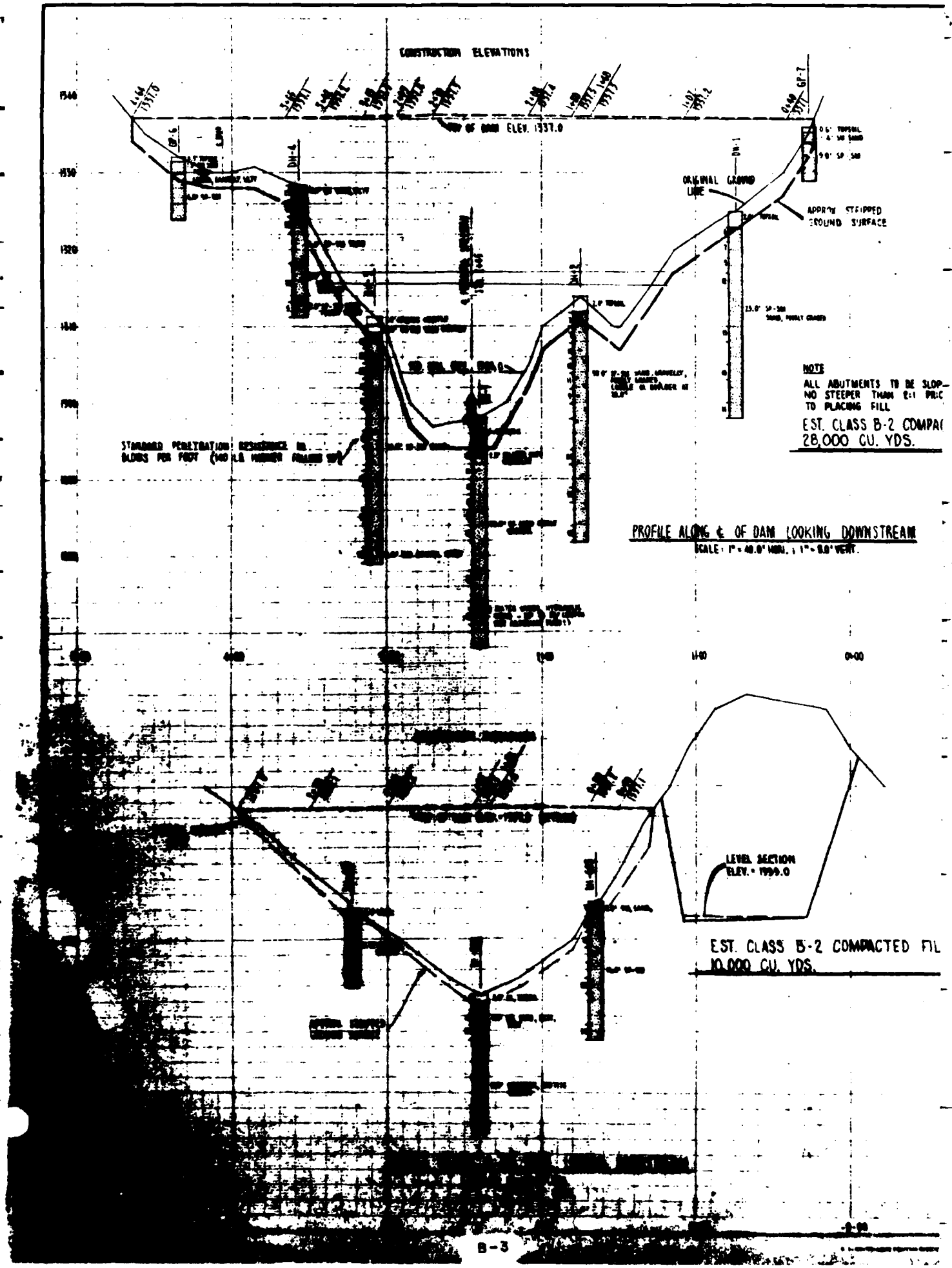
8. Construction progress photographs.

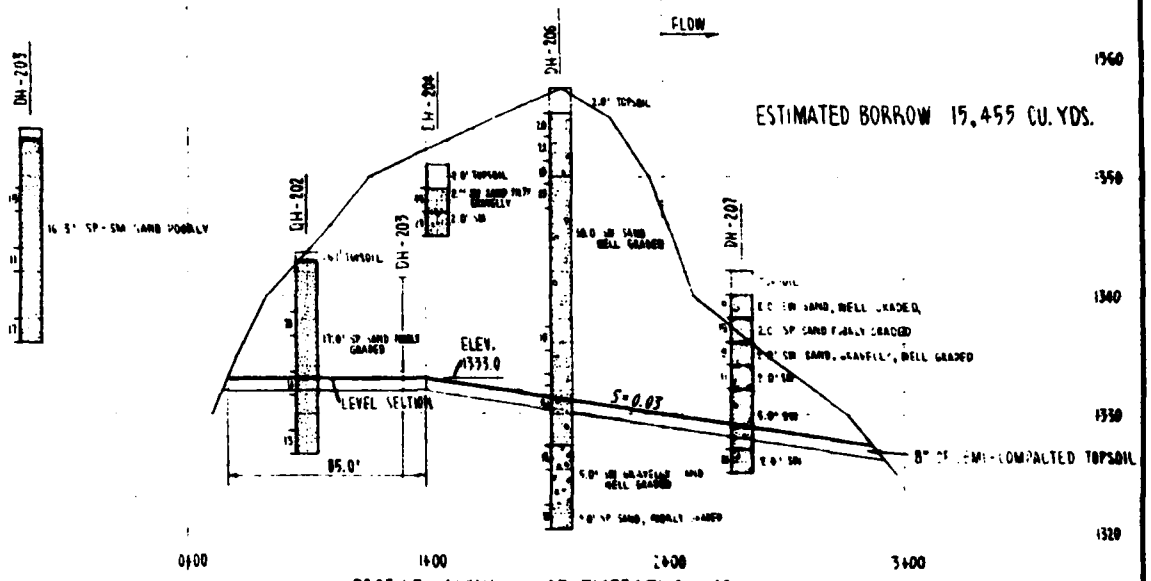
9. Connecticut Watershed Operations and Maintenance Handbook, Soil Conservation Service, September 1971.

10. Soil Test Results, Change Orders and miscellaneous construction records.


CURVE DATA
I
II
LEGEND
STREAM
DIRT ROAD
FENCE
TEST PITS LOGGED & SAMPLED
TEST PITS LOGGED ONLY
TO HUB 4
TRAVERSE LINE "A"
TRAVERSE LINE "B"
EXISTING AREA BELOW ELEV. 1904.0 TO BE CLEARED TO PROPERTY LINE
Area within 200 ft. of principal spillway and below elev. 1934.0 to be cleared.
SEDIMENT STORAGE EL. 1904.0
APPROX. CLEARING LIMIT
EXCAVATE DRAINAGE WORK SEE NOTE 8
TOP OF DAM ELEV. 1943
TOP WIDTH 14.0'
WASTE AREA
WASTE AREA
NECESSARY FOR CONSTRUCTION


DIRT ROAD
FENCE
TEST PITS LOGGED & SAMPLED
TEST PITS LOGGED ONLY
GENERAL NOTES
TRANSVERSE LINE "D"
DITCH
Install 42" CMP CULVERT
DITCH SLOPED TO DRAIN
APPROX CLEARING LIMIT
CURVE I
CURVE II
CLEARING LIMIT
AS-BUILT
SCALE 1"=40'-0"
BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 6
NORFOLK BROOK
NORFOLK, CONNECTICUT
DAMSITE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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CONSTRUCTION ELEVATIONS
TOP OF DAM ELEV. 1337.0
ORIGINAL GROUND LINE
APPROX STRIPPED GROUND SURFACE
NOTE
ALL ABUTMENTS TO BE SLOPED NO STEEPER THAN 2:1 PRIOR TO PLACING FILL
EST. CLASS B-2 COMPACTED FILL 28,000 CU. YDS.
PROFILE ALONG ℄ OF DAM LOOKING DOWNSTREAM
SCALE: 1" = 40.0' HOR., 1" = 8.0' VERT.
LEVEL SECTION ELEV. = 1299.0
EST. CLASS B-2 COMPACTED FILL 10,000 CU. YDS.



ESTIMATED BORROW 15,455 CU. YDS.

PROFILE ALONG ℄ OF EMERGENCY SPILLWAY

SCALE: 1" = 40.0' HORIZ.; 1" = 8.0' VERT.



TYPICAL SECTION OF EMERGENCY SPILLWAY

EST. TOPSOIL, 1650 CU. YDS.

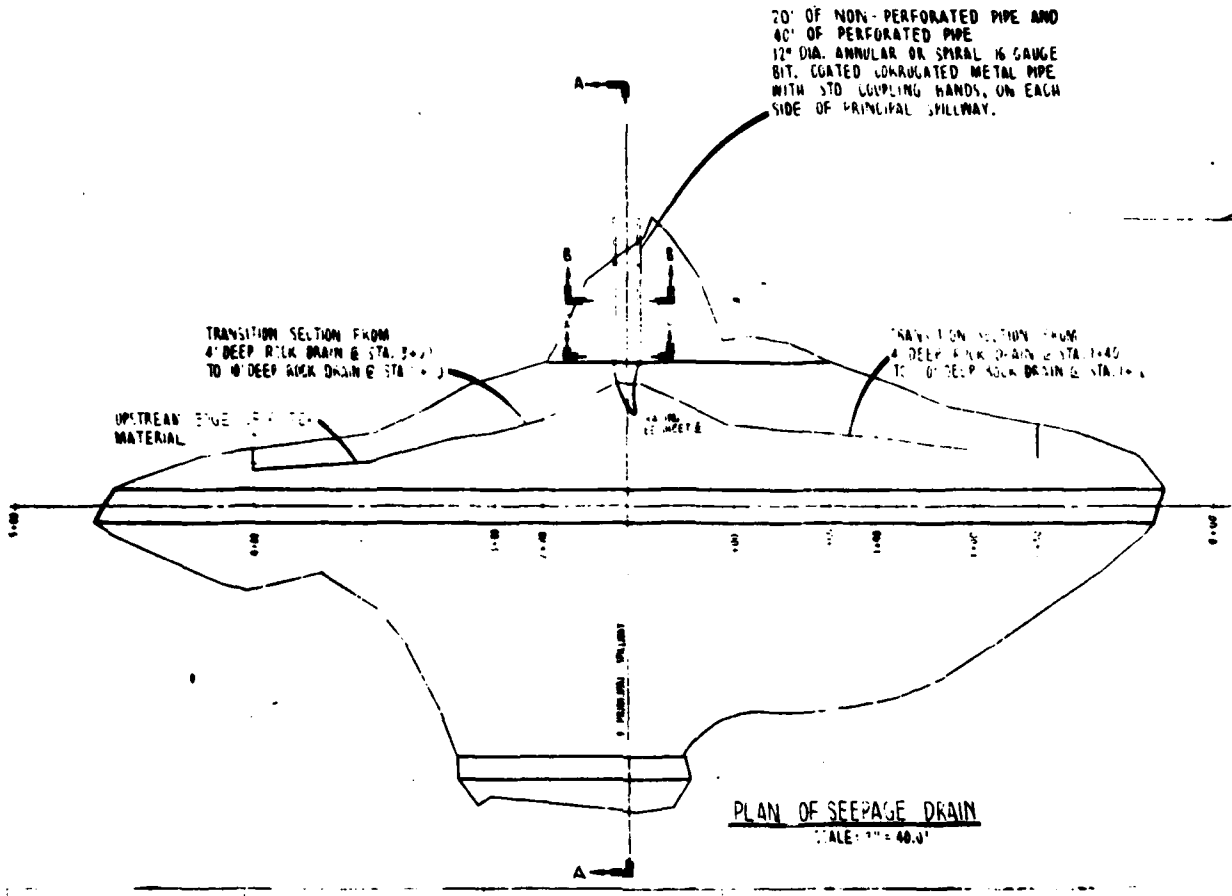
AS-BUILT

BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 6
NORFOLK BROOK
NORFOLK, CONNECTICUT
PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

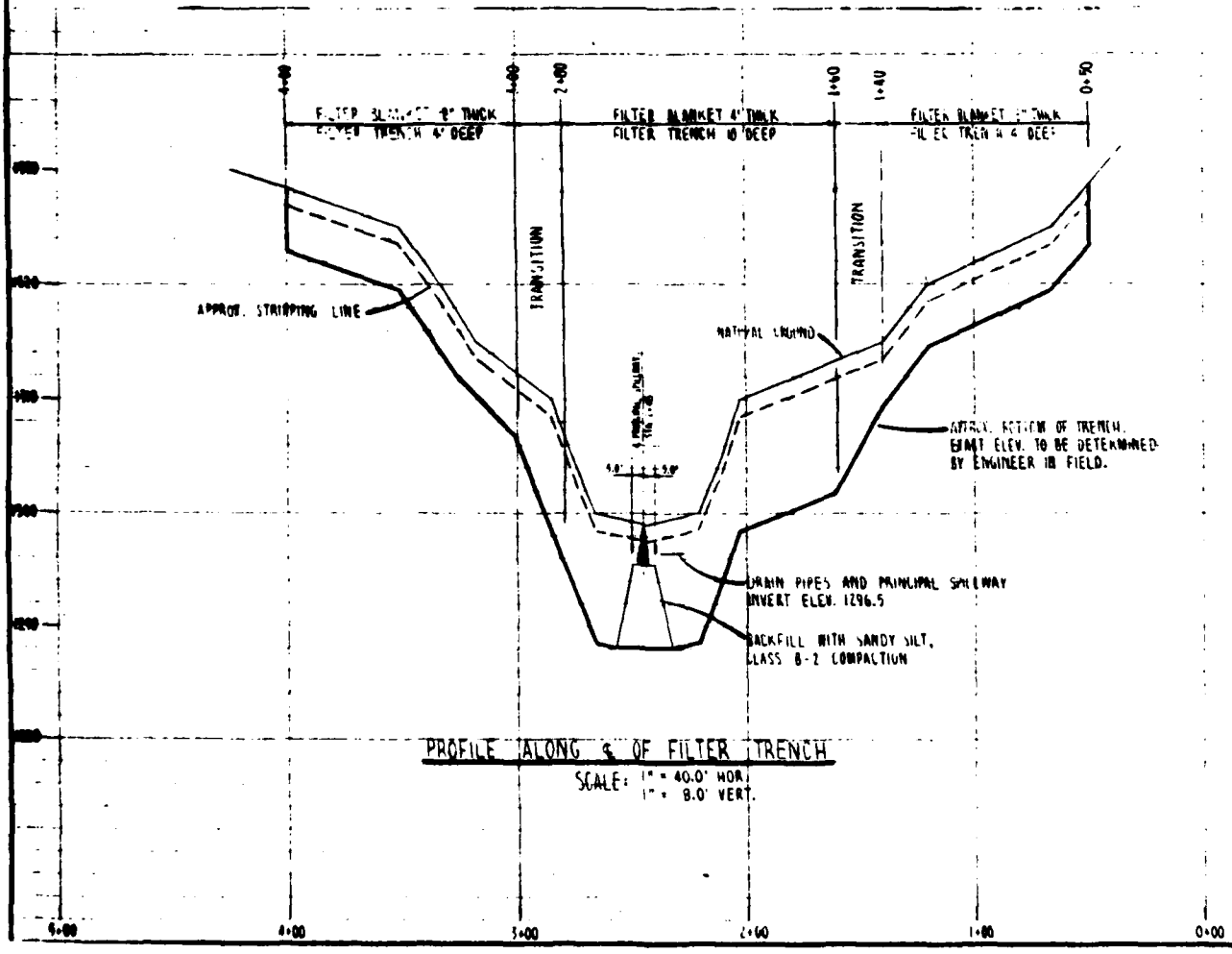
F.D. THEURER — Mar. 81

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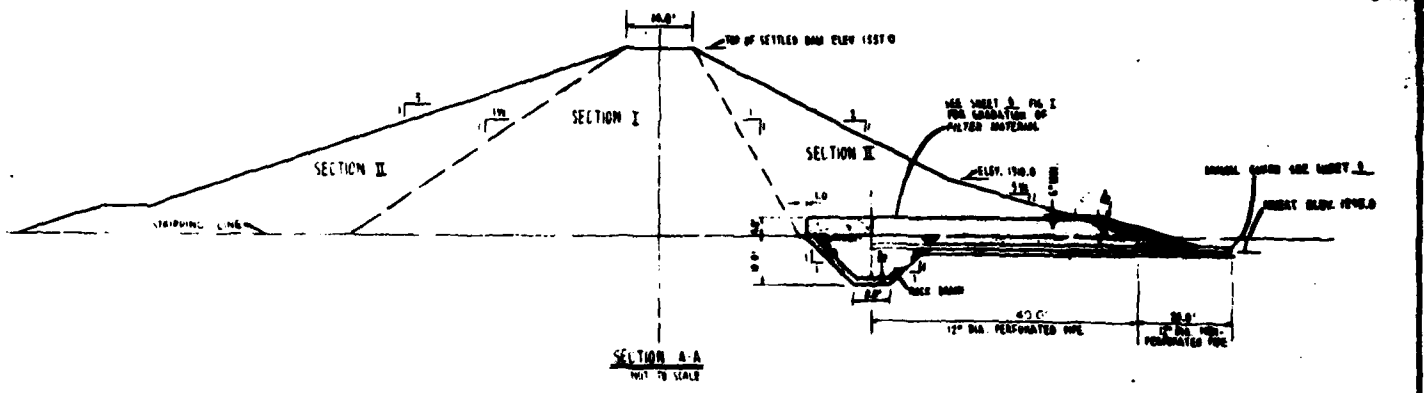
PLAN OF SEEPAGE DRAIN

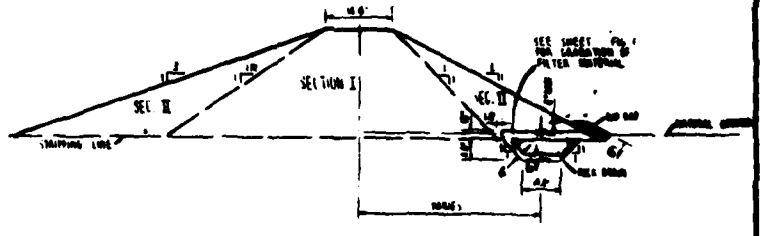
SCALE: 1" = 40.0'



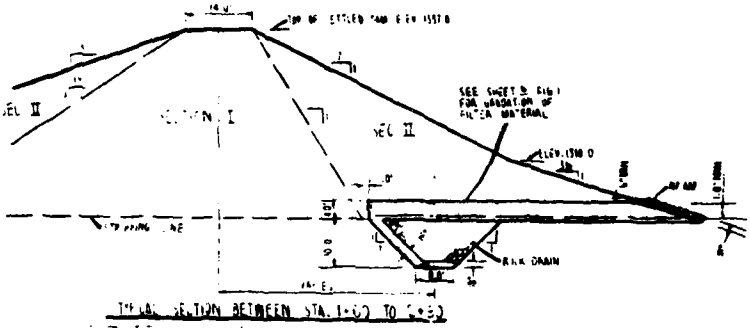
PROFILE ALONG ℄ OF FILTER TRENCH

SCALE: 1" = 40.0' HOR.
1" = 8.0' VERT.

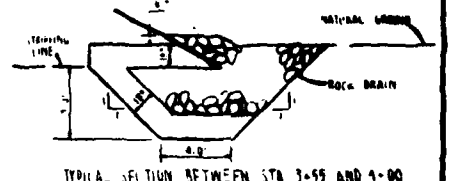




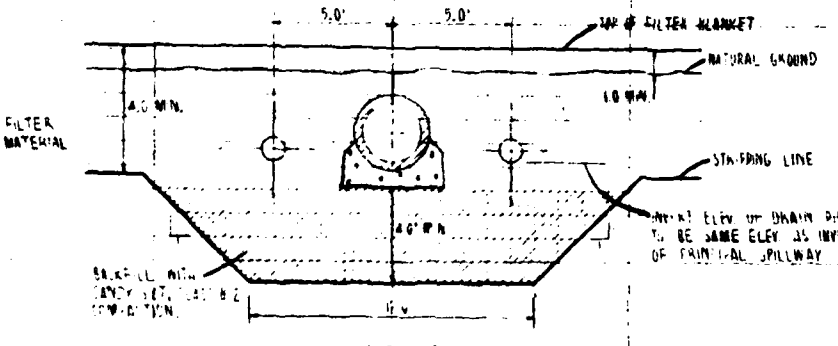
TYPICAL SECTION BETWEEN 0+58 TO 1+40 AND 3+00 TO 3+55
NOT TO SCALE



TYPICAL SECTION BETWEEN STA 1+40 TO 3+00

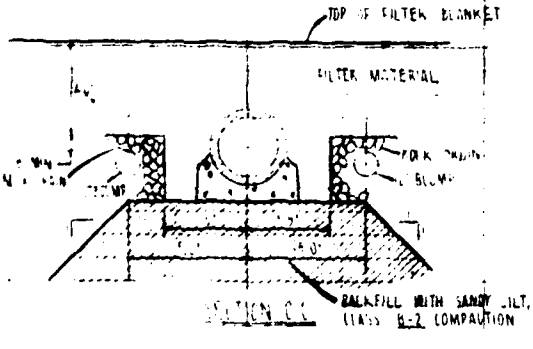


TYPICAL SECTION BETWEEN STA 3+55 AND 4+00



SECTION B-B

EST. COMMON EXCAVATION FOR DRAINS, 1400 CU. YDS.



SECTION C-C

NOTE:
1. SECTION I IN THE EMBANKMENT TO BE COMPOSED OF SILTY SANDS & SILTS AS REPRESENTED BY TPS 108, 109, 114, 115, 116, 119
2. SECTION II TO BE COMPOSED OF SANDS & GRAVELS FROM THE EMERGENCY SPILLWAY EXCAVATION
3. THE SUITABILITY OF MATERIAL & THEIR DISPOSITION IN THE FILL SHALL AT ALL TIME, BE SUBJECT TO APPROVAL BY THE ENGINEER. SEE SPEC. 5-6
4. ~~ROCK MEET GRADED RUN OF TO 12" FOR BOTH RIP-RAP~~ AND ROCK DRAIN.
5. SEE SHEET 6 FIG. 1 FOR GRADATION OF FILTER MATERIAL

AS-BUILT

BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 6
NORFOLK BROOK
NORFOLK, CONNECTICUT
SEEPAGE DRAIN DETAILS - DAM
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

W.H. MORGAN
S. ROSSIER 6-61
9
CN - 408-P

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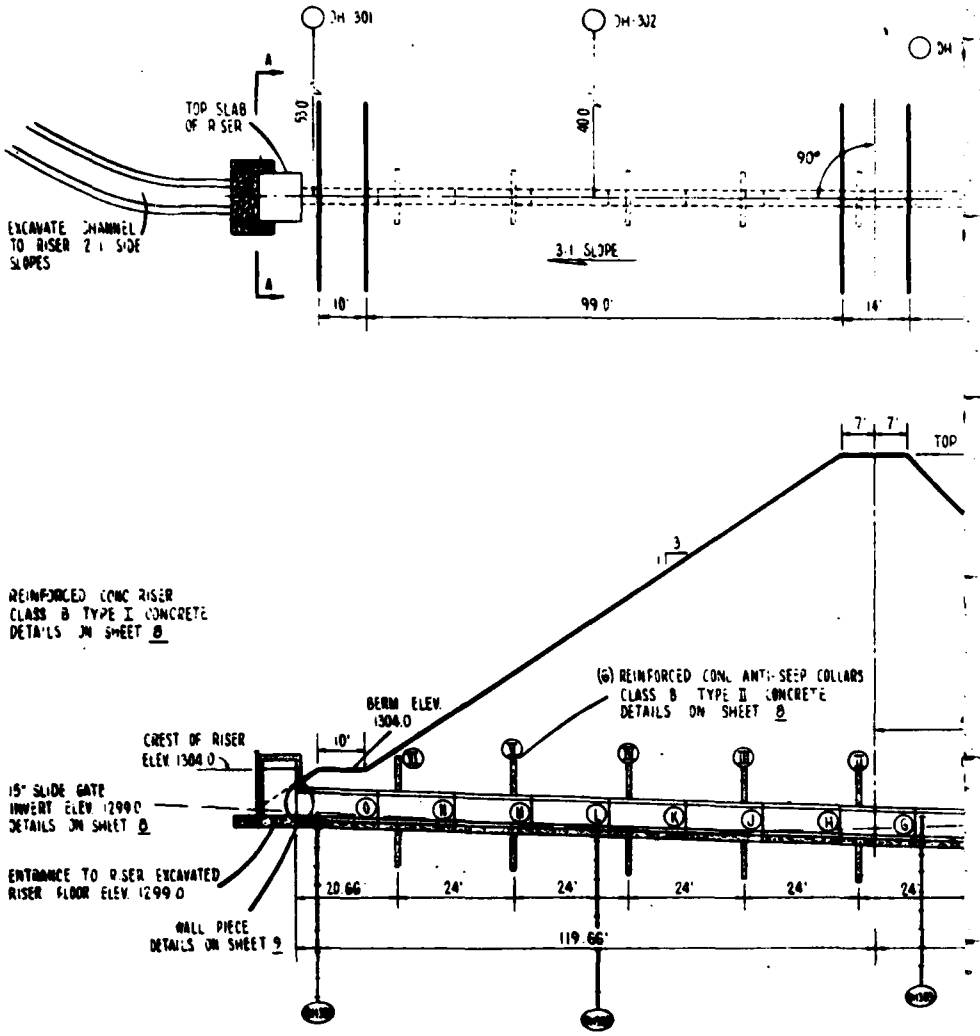
(2)

Form SCS 317 (November 19-

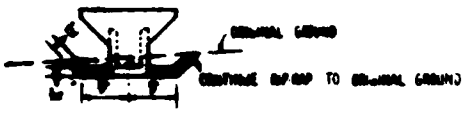
POINT	DISTANCE FROM DISCHARGE END OF 30" DIA PIPE IN FEET	INVERT ELEV OF 30 DIA PIPE WITH COLLAR
OUTLET	0	1295 00
A	16	1295 40
B	32	1295 86
C	48	1296 25
D	64	1296 63
E	80	1297 00
F	96	1297 38
G	112	1297 72
H	128	1298 26
J	144	1298 30
K	160	1298 55
L	176	1298 79
M	192	1298 88
N	208	1298 95
O	224	1298 97
RISER	240	1297 00

I	100	1297.46
II	124	1297.98
III	148	1298 38
IV	172	1298 70
V	196	1298.88
VI	220	1298 96

PIPE LENGTHS ARE NOMINAL AND DO NOT INCLUDE CREEP



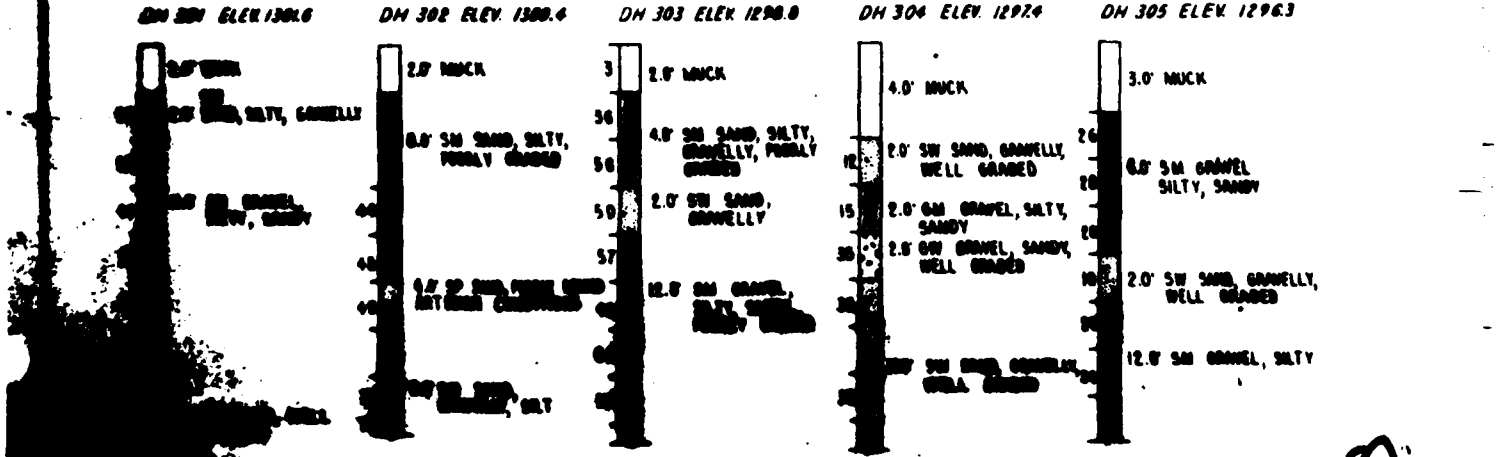
PLAN & PROFILE ALONG ℄ OF PRINCIPAL

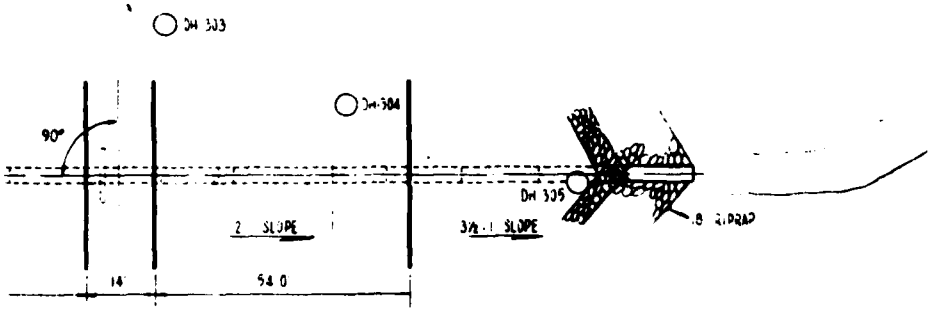


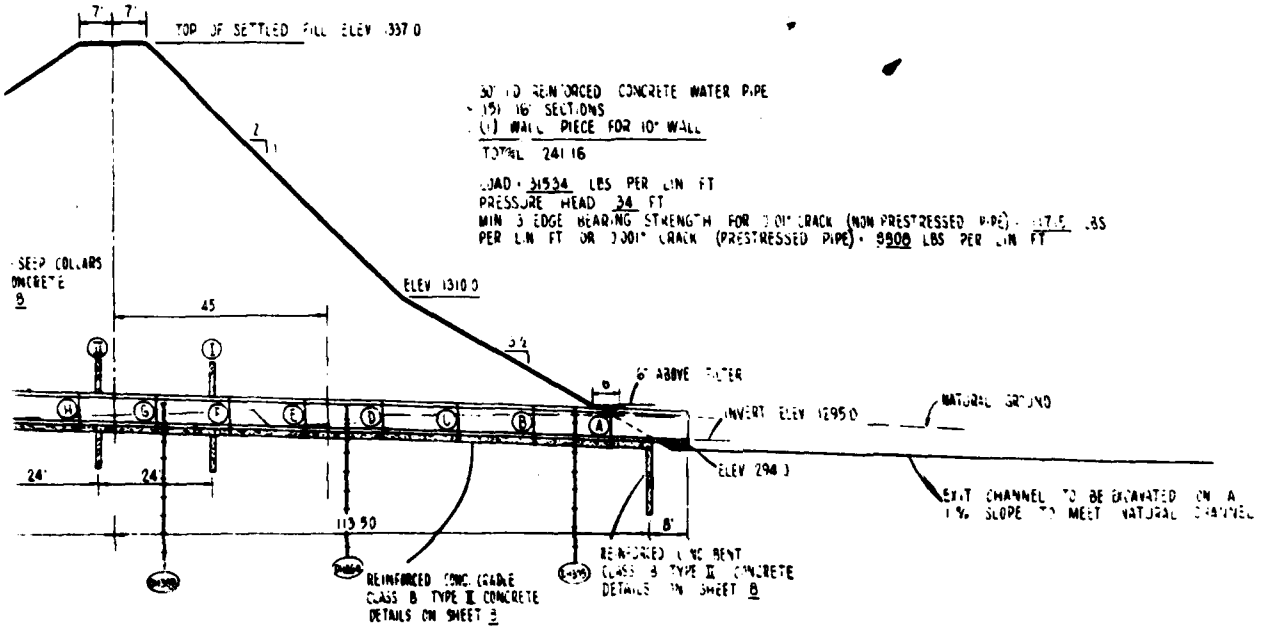
SECTION A-A

SOIL DATA

SCALE: 1" = 4'-0"







30" ID REINFORCED CONCRETE WATER PIPE
151 16' SECTIONS
(1) 8' PIECE FOR 10' WALL
TOTAL 241.16

LOAD = 31534 LBS PER LIN FT
PRESSURE HEAD 34 FT
MIN 3 EDGE BEARING STRENGTH FOR .01" CRACK (NON PRESTRESSED PIPE) = 1175 LBS PER LIN FT OR .001" CRACK (PRESTRESSED PIPE) = 9800 LBS PER LIN FT

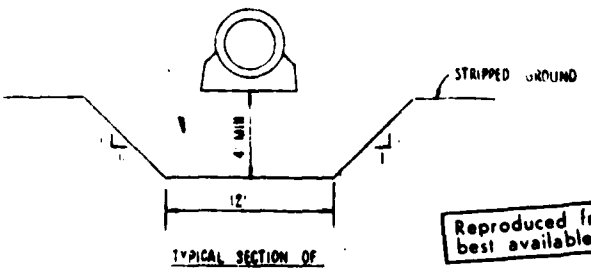
REINFORCED CONC CRADLE CLASS B TYPE II CONCRETE DETAILS ON SHEET 8

REINFORCED CONCRETE CLASS B TYPE II CONCRETE DETAILS ON SHEET 8

OF PRINCIPAL SPILLWAY SCALE HORIZ 1" = 20' VERT 1" = 10'

NOTE

FOUNDATION MATERIALS TO BE EXCAVATED A MIN DEPTH OF 4 BELOW BASE OF CRADLE AND RECOMPACTED WITH SANDY SILT CLASS 6.2 COMPACTION.



TYPICAL SECTION OF PRINCIPAL SPILLWAY EXCAVATION

EST. COMMON EXCAVATION, 400 CU. YDS.

AS-BUILT

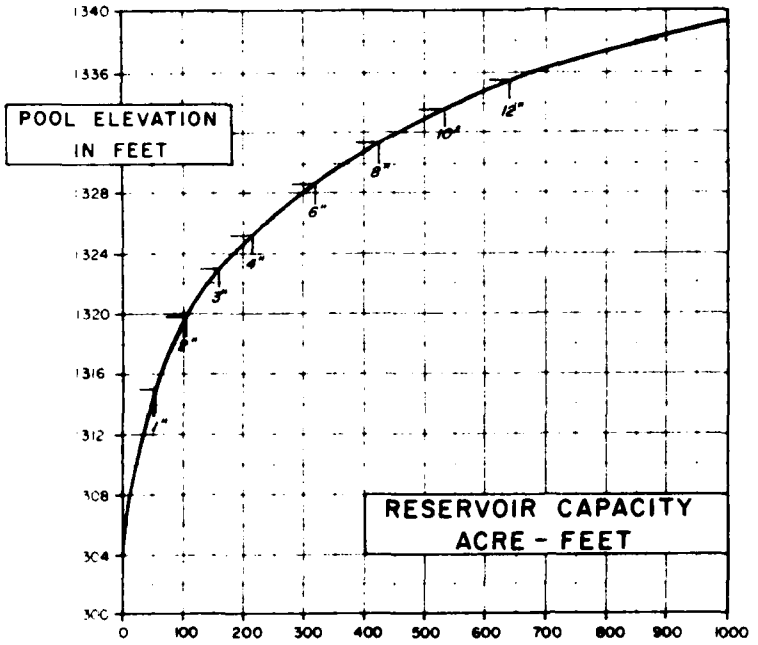
BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 6
NORFOLK BROOK
NORFOLK, CONNECTICUT
PLAN & PROFILE OF PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H. L. WALL	Date Mar 64	Approved by	Date
Drawn C. B. FORD	Mar '64	Title	
Traced			
Checked H. L. WALL		Sheet No. 7	Drawing No. CT-458-P

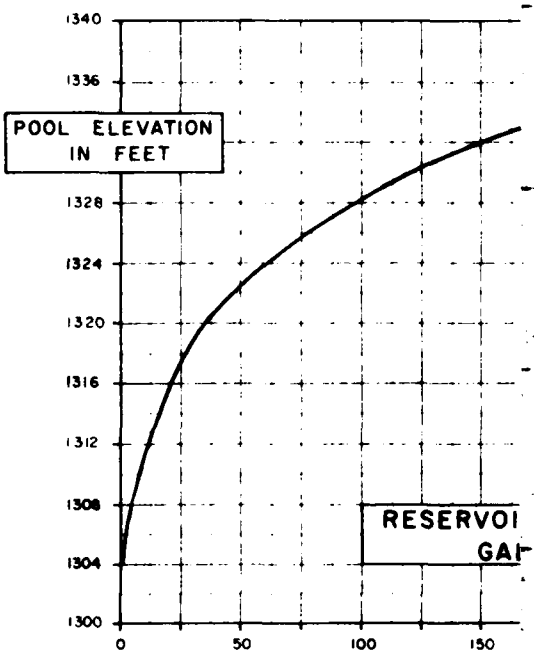
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RESERVOIR OP

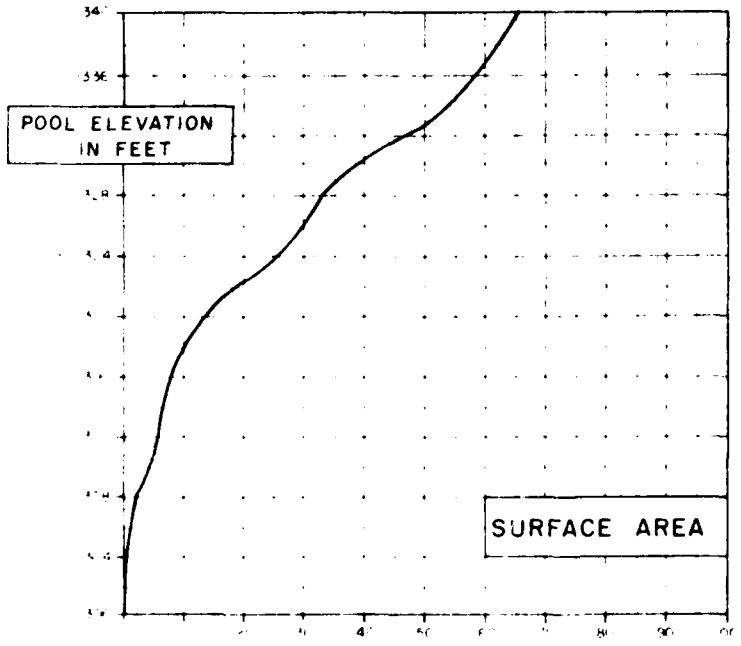
SITE NO. 6 -- NORFOLK BROOK



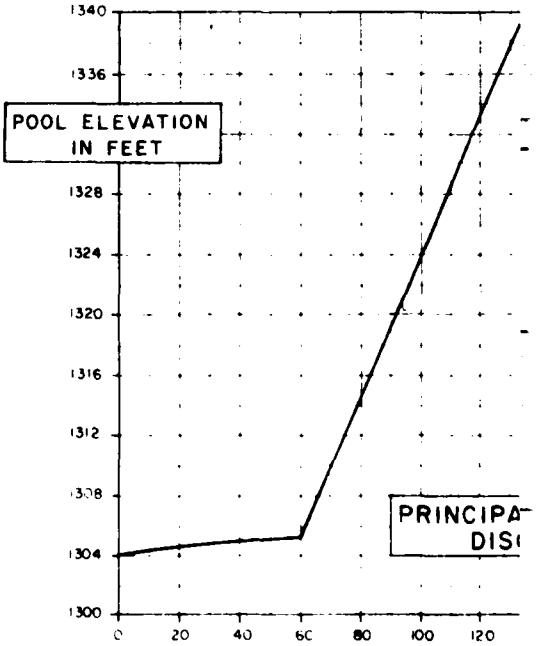
STORAGE CAPACITY IN ACRE - FEET
ABOVE CREST OF PRINCIPAL SPILLWAY



MILLIONS OF U.S. GAL



SURFACE AREA IN ACRES
ABOVE LOW POINT OF RESERVOIR

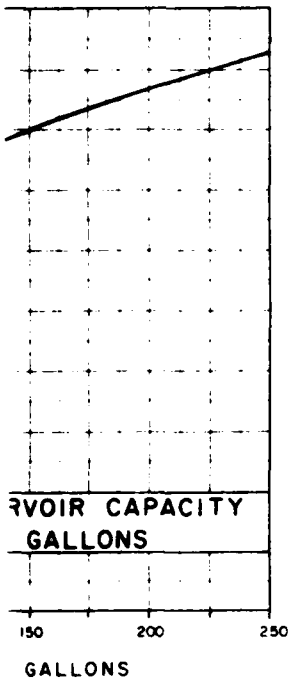


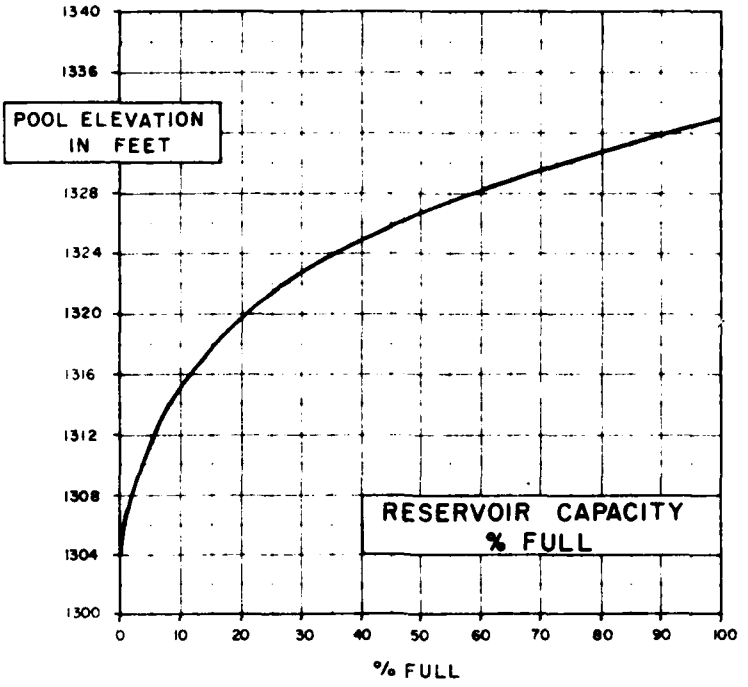
DISCHARGE IN CUBIC FEET P

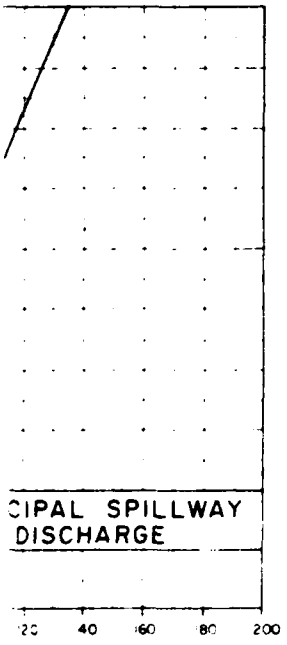
(1)

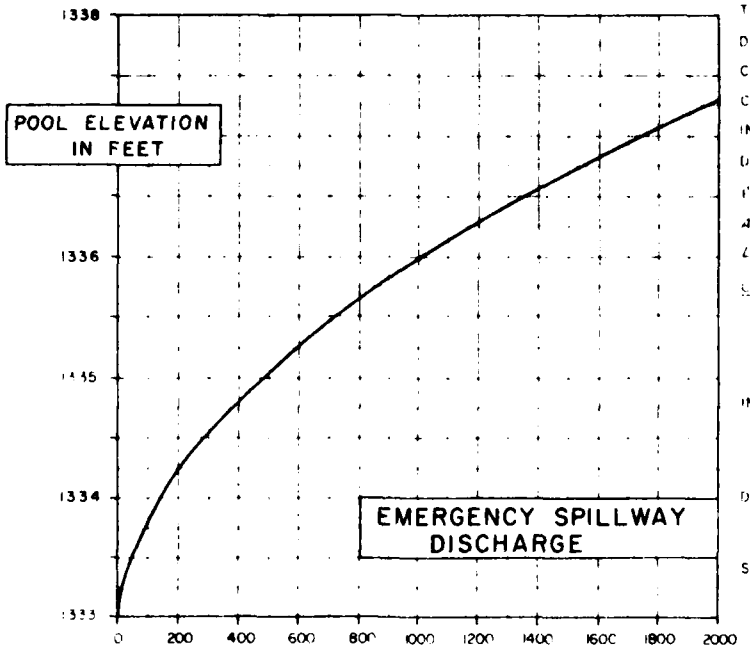
)PERATION DATA

(= BLACKBERRY RIVER WATERSHED









PERTINENT DATA

TOP OF DAM	EL 1337.9
DESIGN HIGH WATER	EL 1334.6
CREST EMERGENCY SPILLWAY	EL 1333.0
CREST PRINCIPAL SPILLWAY	EL 1304.0
INVERT LOW FLOW ORIFICE	EL 1299.0
DRAINAGE AREA CONTROLLED	1.0 SQ MI
1" OF RUNOFF = 53.33 ACRE-FEET	

ALL ELEVATIONS REFER TO MEAN SEA LEVEL DATUM

CONSTRUCTED BY
STATE OF CONNECTICUT
DEPARTMENT OF AGRICULTURE &
NATURAL RESOURCES
JOSEPH N. ...E, COMMISSIONER

IN ASSOCIATION WITH THE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PUBLIC LAW 566 FUNDS

DESIGNED BY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATUS
COMPLETED ... NOVEMBER 19, 1964

Anderson Nichols Associates February 96?

(2)

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN.
217 HEBRON AVENUE
PHONE MEDFORD 3-9401

PROVIDENCE 3, R. I.
200 DYER STREET
PHONE GASPEE 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, JR.
ECTOR L. GIOVANNINI

July 18, 1961

REPLY TO: Glastonbury

William S. Wise-Director
State Water Resources Commission
State Office Building
Hartford 15, Connecticut

Re: Our File 57-73-25-6
Blackberry Watershed
Detention Reservoirs
Site No. 6 - Norfolk Brook

Dear Mr. Wise:

In accordance with your authorization dated August 28, 1958 and as requested in your letter of July 13, 1961, we have reviewed the design of the referenced project submitted for approval by the State Department of Agriculture.

Design criteria established in letter dated April 30, 1959 from Mr. Charles J. Pelletier, Hydraulic Engineer, are tabulated herewith for comparison with actual design data.

	Design Data	Criteria
Drainage Area	1.0 sq. mi.	
Design Storm	15" in 6 hrs.	15" in 6 hrs.
Total Precipitation Loss	1.5"	1.5"
Net Run-off	13.5"	13.5"
Design Peak	2250 cfs	
Per Sq. Mile	2250 cfs	
Drawdown Time from Principal Spillway Design Storm Highwater	1.4 days	0-5 days
Drawdown Time from Crest of Emergency Spillway	2.5 days	0-5 days
Total Discharge	425 cfs	
Earth Spillway Discharge	305 cfs	
Earth Spillway Width	80' (bottom)	
Dc at Control Section	.84	
Vc at Control Section	4.4 fps	9 fps
Maximum Velocity in Exit Channel	5.1 fps	9 fps
Freeboard	2.4'	2.0' min.

All of the design data computations have been checked and we find them to be substantially correct. As shown in the above listing the design meets the criteria established in all instances.

It is recommended that a Construction Permit for the construction of this dam be issued.

Very truly yours,

John J. Mozzochi and Associates
Civil Engineers

WWF:hk

DESIGN REPORT

BLACKBERRY RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 6
LITCHFIELD COUNTY, CONNECTICUT

The site of this proposed floodwater retarding dam is located approximately 0.9 miles southeast of Norfolk, Connecticut. This dam is located on Norfolk Brook which is a tributary of Wood Creek. The geographic location may be found on the Norfolk quadrangle published by the U. S. Geological Survey. Sheet 4 is a transparent overlay which will assist in locating the site.

This dam will provide temporary floodwater storage which will be released through controlled outlets. It will be constructed of compacted earth fill with a drainage system in the downstream toe.

The principal spillway consists of a 30-inch reinforced concrete water pipe and a 2.5' x 7.5' reinforced concrete riser.

The emergency spillway will be earth with a vegetative cover. It is set 6.4 feet above the elevation obtained by routing the equivalent of 6.71 inches of runoff from a six hour storm. (Hurricane Diane 1955).

This storm was routed through the principal spillway to determine the lowest possible elevation of crest of the emergency spillway. This was determined to be elevation 1326.6, the crest was raised to elevation 1333.0 in order to avoid excessive excavation of unusable material. The emptying time from elevation 1326.6 to the crest of the riser is 1.38 days.

The dam was classified as a class (c) structure in accordance with the criteria as established in Washington Engineering Memorandum SCS-27.

There is no permanent water storage. A minimum height riser was used with a 12-inch diameter orifice at the base to discharge normal flows. Trash racks and an anti-vortex device have been provided.

The design high water elevation was set at 1334.6 by using the State of Connecticut criteria of a minimum of 15 inches of rainfall for a 6-hour period, with a maximum of 1/4" per hour infiltration routed from the crest of the riser. The duration of flow and maximum velocity through the emergency spillway is 23.7 hours and 5.4 feet per second, respectively, for this storm.

The flood routing procedure used determined the maximum stages shown in the following table:

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO CN-408-R SHEET 1 OF 4 DATE 3/15/61

DESIGN REPORT

Factors Which Determine Stage	Surface Area Acres	Runoff in Inches	Peak Outflow CFS	Peak Inflow CFS	Elev. of Maximum Stage Feet	Storage Ac.-Ft.	Element of Structure Determined by Maximum Stage
50 year sediment	-	-	-	-	1299.0	Negligible	Orifice
Hurricane Diane	-	8.51	120	760	1326.6[1]	257	Check crest of emergency spillway
State of Connecticut criteria 15" for 6 hours	-	13.5	425	2250	1334.6	595	Design high water
2-1/2x6 hour point rainfall moisture condition II		18.8	1390	3120	1336.4[2]	700	Check top of dam

[1]Crest of emergency spillway was set at elevation 1333.0.

[2]Top of dam was set at elevation 1337.0.

The information from the Soil Mechanics Laboratory report and the geology report was used in the design. Copies of both are attached.

The references used in designing were:

1. Hydrology, Section 4-A
2. Hydraulics, Section 5
3. Structural Design, Section 6

The listed publications can be obtained from Mr. N. Paul Tedrow, State Conservationist, U. S. Department of Agriculture, Soil Conservation Service, Storrs, Connecticut.

REFERENCE	U.S DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY PENNSYLVANIA	DRAWING NO CN-408-R SHEET 2 OF 4 DATE 3/15/61

DESIGN REPORT

Concurred:

Gerald E. Oman
Design Engineer

T. R. Wire
Acting State Conservation Engineer

Vincent McKeever
Hydrologist

Robert F. Fonner
Geologist

REFERENCE	U. S DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY PENNSYLVANIA	DRAWING NO. CN-408-R SHEET 3 OF 4 DATE 3/15/61

GEOLOGY REPORT

BLACKBERRY RIVER WATERSHED
NORFOLK BROOK, SITE NO. 6
NORFOLK, CONNECTICUT

REPORT NO. CN-408-G
Prepared by:

Concurred:

Samuel J. Smith, State Conservation Engineer, Storrs, Connecticut

William M. Brown, Geologist
SCS, Storrs, Connecticut

I. Introduction
A. General

State: Connecticut County: Litchfield

Site: No. 6 Location: Norfolk, Conn.

Investigated by: William M. Brown, Geologist Date: 4/60

Equipment Used: 2 Acker Drills; 1 John Deer Dozer

Site Data:

Drainage area: 1.09 sq. miles 697.6 acres

Type of structure: Compacted Earth Purpose: Flood Prevention

Height of fill: 39.0 feet; Length of Embankment: 440 feet

Volume of fill: 38,500 cu. yds.

Location of emergency spillway: Left Bank

Storage Allocation

	Depth at dam (feet)	Surface area (acres)	Volume (ac. ft.)
Sediment :	4	1.6	3.4
Floodwater:	29	49.4	513

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. CN-408-G SHT 1 36 7/15/60

GEOLOGY REPORT

B. Surface Geology and Physiography

Site No. 6, Blackberry River Watershed, is in the Berkshire and Housatonic physiographic province. The left and right abutments have slopes of 20% and 17% respectively set in a region of moderate to steep relief. The width of the floodplain at the centerline of the dam is approximately 60 feet.

The glacial deposition at the site consists primarily of clean stratified and nonstratified sands and gravels.

The underlying bedrock which is poorly exposed in the dike area because of soil cover is the Berkshire Gneiss complex of the highlands and is generally regarded as Pre-Cambrian in age. The bedrock ranges from a coarse grained quartz biotite gneiss to a very fine grained biotitic gneiss with some small schist and quartzite veins. The principal minerals are biotite, Muscovite, feldspar, quartz and some magnetite. The apparent strike and dip of the bedrock exposed in the area of the dike is N 30° W with a dip of 11° to the NE. This however is applicable only at the point of measurement and does not have any regional application because of the warping and bending of the bedrock. An ill-defined joint system was detected generally paralleling the axis of the centerline of the dike or N 50° E.

No sediment or erosion problem is anticipated in the sub-watershed behind the structure since ground cover is woodland. The streambanks are slightly eroding and the stream channel somewhat aggrading.

II Subsurface Geology

A. Centerline of Dam

Two holes were drilled in valley bottom along the centerline of the dam to investigate and evaluate foundation conditions below the fill area. The materials encountered below a two or three foot organic mantle are primarily sands with various gradations of silts and gravels. The sands and gravels for the most part have a medium dense in place relative density as indicated by the blow count per foot on a split spoon sampler. In hole 5 however, the materials were loose up to a depth of 10 feet.

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. CN-408-G SHT. 2 36. DATE 7/[illegible]/60

No low volume-weight materials were penetrated in any of the borings made along the centerlines of either the dam or dike.

Three samples were taken by use of a tractor-mounted backhoe to obtain samples on each of the two abutments and in the valley bottom. The samples were collected for development of possible filter design criteria.

The abutments during the course of drilling were not capable of retaining any of the water used in washing during drilling procedure. The water was lost through the underlying loose permeable sands and gravels.

B. Centerline of Outlet Structure

Five holes, 6-301 through 6-305, were drilled along the approximate axis of the principal spillway. The maximum depth of penetration was hole 6-303 which went 42 feet. This hole location also coincided with the centerline of the dam. All of the holes along the centerline of the conduit penetrated gradations of sands to gravels and vice versa having an estimated dense in place relative density as indicated by the blow count. In hole 6-302, artesian conditions from 10 to 12 feet were found in which the water crested over the casing by approximately 1/4 inch. The acquifer could not be correlated with any other hole either by other water-bearing zones or similar strata.

No low volume-weight materials were encountered during drilling. The holes, as did the other foundation holes, pointed out the lack of uniformity of the foundation materials and the inability to correlate strata or acquifers.

C. Emergency Spillway

The emergency spillway is located on the left side of the valley between the dam and the dike. Seven holes were drilled in the proposed location of the spillway area. The holes averaged 9 feet below the anticipated grade line of the spillway section. The materials consist primarily of well and poorly graded sands with some gravels as a minor fraction. Fines are virtually absent in any of the sands in the spillway area. No bedrock was encountered in any of the drill holes.

The materials encountered have tentatively been identified as SP's and SW's with gravels.

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. CN-408-G SHEET 4 36 DATE 7/15/60

GEOLOGY REPORT

D. Borrow Areas

Thirty-two borrow pits were dug at the site to evaluate the suitability of the material for use as borrow. A number of samples were collected for possible laboratory analysis. Sand-sieve analyses were also performed on many of the samples collected prior to selection for shipment to the laboratory.

Samples 6-102 through 6-133 are all disturbed and represent three borrow areas. Drill hole, 6-101 was drilled outside of the emergency spillway limits to evaluate the area as a possible source for filter material.

Borrow area "A" from the emergency spillway excavation is represented by pits 6-102, 6-103, and 6-104.

Borrow area "B" is located upstream from the dam on the right (east) side of Norfolk Brook. Cross sections H-H' and I-I' depict the materials encountered. They have tentatively been identified as GP's and SM's.

Borrow area "C" is located upstream from the dam on the left (west) side of Norfolk Brook. Cross section E-E' depicts the materials encountered in this borrow area. The materials have tentatively been identified as GP's, SP's, and SP-SM's.

The following summarizes the samples taken and their tentative classification by field identification and/or sand-gravel sieve analysis:

Sample Number	Depth (Feet)	Field Class.	Sand-Gravel Sieve
6-SM-1	2.6-4.0	SM	GP
6-6-1	2.0-6.0	SM	SP
6-7-1	2.0-7.0	SP	SP-SM

REFERENCE:

U.S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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GEOLOGY REPORT

Sample Number	Depth (Feet)	Field Class.	Sand-Gravel Sieve
6-102-1	2.9-6.5	SW	SP
6-103-1	1.5-6.0	SW	
6-104-1	2.5-6.0	SW	
6-105-1	1.0-6.0	SW - SM	
6-106-1	2.0-6.0	SP - SM	SP
6-107-1	2.0-6.0	SW - SM	SP
6-108-1	2.0-6.0	SM	SP - SM
6-109-1	4.0-7.0	SM - ML	
6-110-1	2.2-6.5	SM - ML	
6-111-1	1.0-5.0	SW - SM	SM
6-112-1	3.0-6.0	SM	
6-113-1	1.5-6.0	SW - SM	
6-114-1	3.5-7.5	SM - ML	
6-115-1	3.0-6.0	SM - ML	
6-116-1	3.0-6.0	SM - ML	ML
6-117-1	3.5-6.5	SM - SM	SP or GP
6-118-1	2.0-7.0	SP - SM	SP - SM
6-119-1	1.0-5.0	SM - SM	
6-120-1	2.5-5.5	SP - SM	SP - SM
6-122-1	2.0-5.0	SP	GP
6-125-1	2.5-7.0	SM	SM
6-130-1	1.5-7.0	SW	GP
6-132-1	1.0-6.0	SW	GP
6-133-1	2.0-7.0	SM	SM

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO. CN-408-6
6 36
7/15/60

GEOLOGY REPORT

	Type	Field Class	Sand-Sieve Analysis
6-1A1-1	Composite		SP-SM
6-1A2-1		SM	
6-1A3-1		SM	
6-1A4-1		GM	

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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GEOLOGY REPORT

E. Relief Well and Foundation Drain Explorations

No specific exploration was undertaken to evaluate foundation conditions for the above purposes. The holes along the centerline of the dam and principal spillway are considered adequate for the evaluated foundation conditions in a narrow valley such as this. Discussion of these conditions is covered in section A and B of this report.

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. CN-408-6 SHEET 8 36 DATE 7/15/60

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Connecticut

Watershed Blackberry River Subwatershed Site No. 6

Logged by W.M. Brown Date April 19 60 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Acker Drills Location of Holes Centerline right abutment

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb	Type Bit Used	Samples No.	Samples Type *	Samples From Ft.	Samples To Ft.	Samples Rec. † %
6-1	1325.0 0+76	0.0	2.0		Topsoil and subsoil.							
		2.0	4.0	6	Sand, poorly graded, fine to medium grained, brown, muscovite flakes	SP-SM	*	1	SS *			
		4.0	6.0	7	Same as above with somewhat better grading.	SP-SM		2				
		6.0	8.0	9	Same as above. Some angular quartzitic fragments from gravels or small cobbles.	SP-SM		3				
		8.0	10.0	12	Same as above	SP-SM		4				
		15.0	17.0	15	Same as above	SP-SM		5				
		20.0	22.0	18	Same as above	SP-SM		6				
		25.0	27.0	14	Same as above	SP-SM		7				
					The above SP's-SM's all exhibit loose to medium relative densities.							

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* Disturbed-undisturbed-rock core. † Percent sample recovery
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

* Split spoon

CN-408-6

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WPJ WPS X FP Pub 46

Drilling Equipment Acker Drills Location of Holes Right Abutment - Centerline

Hole No	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif Soil Class. Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. % †
6-2	1313.8	0	2.0		Topsoil and subsoil			6-2-1	D.	2.0	6.0	(Backhoe)
	1+74	2.0	4.0	7	Sand, gravelly, well graded, sand grains angular, some gravel fragments.	SP-SM		1	SS			
		4.0	6.0	7	Sand, fine to medium grained, poorly graded, less gravel, moist.	SP-SM		2	"			
		6.0	8.0	12	Same as above.	SP-SM		3	"			
		8.0	10.0	12	Sand, well graded, gravel-subround, loose, moist.	SP-SM		4	"			
		10.0	12.0	11	Same as above.	SP-SM		5	"			
		12.0	14.0	9	Sand, fine grained, poorly graded. Water table at 15'6".	SP-SM		6	"			
		14.0	16.0		At 19.0 feet, enter medium grained sand, brown, some gravel, wet and moist.	SP-SM				14	16	Slipped Sample
		20.0	22.0	34	Cobble or boulder at 20.0 feet.	SP-SM		7	"			
					At 22'9" enter sand, fine to medium grained gravelly, poor grading, Muscovite flakes.							
		25.0	27.0	21	Sand, fine grained, poorly graded.	SP-SM		8	"			

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* Disturbed-undisturbed rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub 46

Drilling Equipment Acker Drills Location of Holes LEFT Abutment - Centerline

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft	Samples Rec % †
		30.0	32.0	29	Same as above	SP		9	SS			
								6-3-1	D.	2.0	4.0	(Bouldar)
6-3	1311.3	0.	2.0	28	1 foot organic mantle. 1 to 2.0' - sand, gravelly,	OL SM		1	" SS			
	3-8				poorly graded, Muscovite flakes, quartzitic							
					fragments.							
		2.0	4.0	36	Sand, well graded, gravelly, fragments 25%.	SP-SM		2				
		4.0	6.0	22	Same as above.	SP-SM		3				
		6.0	8.0	12	Same as above.	SP-SM		4				
		8.0	10.0	12	Same as above.	SP-SM		5				
		15.0	17.0	27	Sand, well graded, gravelly, sand coarser.	SP-SM		6				
		20.0	22.0	18	Same as above.	SP-SM		7				
		25.0	27.0	14	Same as above.	SP-SM		8				
		30.0	32.0	35	Gravel, sandy.	GW		9				
6-4	1328.3	0.0	2.0	23	Sand, silty, poorly graded	SM		1				
	3+57	2.0	4.0	28	Sand, silty, poorly graded, quartz cobbles	SM		2				
		4.0	6.0	33	Sand, well graded, abundant fragmental quartz	SP-SM		3				
					broken off from cobbles, sand grains angular.							

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub watershed Site No. 6

Logged by W. M. Broun Date April 19 60 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Acker Drills Location of Holes Centerline

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif Soil Class Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft	Samples To Ft.	Samples Rec %†
		10.0	12.0	11	Sand, gravelly, well graded, fragmental quartzite from cobbles.	SM		4				
		15.0	17.0	5	Sand, poorly graded, fine grained, Muscovite flakes.	SP-SM		5				
6-5	1298	0.0	4.0		Muck and silty sands.							
"	2140	4.0	6.0	27	Sand, silty and gravelly. Angular quartz fragments.	SM		1				
		6.0	8.0	11	Same as above, sand fine grained, poorly graded, gravelly. Muscovite.	SP		2				
		8.0	10.0	8	Sand, fine to medium grained, Muscovite, gravel.	SP		3				
		10.0	12.0	11	Same as above but with more coarse sand.	SP		4				
		12.0	14.0	21	Same as above with sand showing better grading	SP		5				
		14.0	16.0	32	Sand, fine to medium grained, poorly graded and more uniformity in size than above. No gravel.	SP		6				
		20.0	22.0	24	Same as above with lenses of well graded sands and gravels.	SP		7				

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* Disturbed undisturbed rock core. † Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by M. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Acker Drills and Backhoe (6 & 7) Location of Holes Centerline

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. % †
		25.0	27.0	11	Same as above with no well graded sands or gravels.	SP		8				
		30.0	32.0	30	Same as above. From 25-32' artesian conditions with sand coming into casing at sampling interval.	SP		9				
		36.0	38.0	43	Sand-silty, gravelly, poor grading.	SP-SM or SM		10				
		41.0	43.0	45	Gravel - silty, gravelly, well graded.	GM-GM or GM		11				
6-6	1332	0	0.5		Topsoil							
	1+91	0.5	2.0		Sand, poorly graded, gravelly, silty, fine grained.	SM		6-6-1	D	2.0	6.0	
								6-6-2	D	6.0	8.0	
		2.0	8.0		Same as above with more gravel.	SP-SM						
6-7	1336	0	0.6		Topsoil							
	0+26	0.6	2.0		Sand, silty, fine grained.	SM		6-7-1	D	2.0	7.0	
		2.0	7.0		Sand, poor grading, fine grading, some Muscovite.	SP-SM						
6-8A	1297	0	2.0		Backhoe Pit - Mucky -	OL		6-8A-1	D	2.0	4.0	
	2+61	2.0	4.0		Sand, gravelly, well graded, fines ≥ 12%, water to hole level.	GP						

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to L and WP Unit. 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Backhoe Location of Holes Borrow

Hole No.	Station and Surface Elev	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %
6-101	1359.1	0.0	5.0		Topsoil							
		5.0	7.0	9	Sand, gravelly, well graded, angular grains, gravel is rounded. Some mica.	SW		1				
		10.0	12.0	10	Sand, gravelly, poorly graded. Some Muscovite and fragmental quartzitic cobbles.	Sp		2				
		15.0	17.0	11	Same as above, fine to medium grained and no fragmental rock.	SP		3				
		20.0	22.0	25	Sand, gravelly, well graded, grains are angular. Finer fraction lost in washing.	GW		4				
		25.0	27.0	*	Gravel - sandy, well graded. Quartzitic fragments from cobbles and gravels.	SW		5				
		31.0	33.0	*	Sand, poorly graded. 32.0' -Some gravel fragments.	SP						

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* Disturbed-undisturbed-rock core. † Percent sample recover.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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* No blow count since sampler was over-driven.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub 46

Drilling Equipment Backhoe Location of Holes Borrow - Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec † %
6-102	1351.0	0.0	0.9	Topsoil			6-102-1	D	2.9	6.5	
		0.9	2.9	Sand, silty, cobbly	SP-SM						
		2.9	6.5	Sand, poorly graded	SP						
6-103	1359.	0.0	0.4	Topsoil			6-103-1	D	1.5	6.0	
		0.4	1.5	Sand, fine grained, some silt.	SM						
		1.5	6.0	Sand, well graded. Cobbles estimated 10% by volume.	SW						
6-104	1339.7	0.0	0.9	Topsoil	SM		6-104-1	D	2.5	6.0	
		0.9	2.5	Sand, poorly graded, fine grained. Muscovite. Cobbles 5 - 10%.	SP						

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* Disturbed undisturbed rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 ___ WP2 X FP ___ Pub 46 ___

Drilling Equipment Backhoe Location of Holes Borrow - Left Side

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %†
		2.5	6.5	Sand, gravelly, grains-angular to subangular, fines - less than 2%.	SW						
6-105	1320.3	0.0	0.5	Topsoil, gravelly and silty. Roots.			6-105-1	D	1.0	6.0	
		0.5	6.0	Sand, gravelly, well graded. Muscovite flakes. Cobbles 10-15%. Water 4-6'.	SW-SM						
6-106	1321.3	0.0	1.0	Roots and Topsoil			6-106-1	D	2.0	6.0	
		1.0	6.0	Sand, silty, gravelly, sand poorly graded. Gravel is well graded. Muscovite, cobbles - 20%. Water 2-6'.	SP						
6-107	1328.4	0.0	1.0	Topsoil, mucky, highly organic.	OL		6-107-1	D	2.0	6.0	
		1.0	7.0	Sand, gravelly, poorly graded. Cobbles 10-15%. Muscovite flakes.	SP						

* Disturbed-undisturbed-rock core † Percent sample recovery

1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. H. Brown Date April 19 60 Project: WP1 ___ WP2 X FP ___ Pub 46 ___

Drilling Equipment Backhoe Location of Holes Borrow - Left Side

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %†
6-108	1327.2	0.0	0.5	Topsoil, highly organic	OL		6-108-1	D	2.0	6.0	
		0.5	1.3	Sand, gravelly, silty - fine to medium grained.	SP-SM						
		1.3	6.0	Sand, fine-medium grained, uniform in texture and color. Muscovite.	SP-SM						
6-109	1328.7	0.0	3.0	Topsoil, silty, sandy. Cobbles 6" - 10 to 20%.	SM		6-109-1	D	4.0	7.0	
		3.0	4.0	Sand, silty, gravelly. Gravel sizes up to 1".	SM						
		4.0	7.0	Sand, silty. Micaceous, ML fraction.	SM-ML						
6-110	1326.0	0.0	2.2	Topsoil, gravelly.	SM		6-110-1	D	2.2	6.5	
		2.2	6.5	Sand, silty, gravelly. Well graded. Some Muscovite.	SM-ML						

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* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub watershed Site No 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Backhoe Location of Holes Borrow - Left Side

Hole No.	Station and Surface Elev.	Hole Depth From Ft	Hole Depth To Ft.	Description of Materials	Unif. Soil Class Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. % †
6-111	1339.7	0.0	0.4	Roots and Topsoil			6-111-1	D	1.0	5.0	
		0.4	5.0	Sand, silty, gravelly, cobbles 15-20%.	SM-						
6-112	1335.7	0.0	3.0	Sand, silty.	SM		6-112-1	D	3.0	6.0	
		3.0	6.0	Sand, silty, gravelly. Sand- well graded. Cobbles 30%.	SM						
6-113	1346.5	0.0	0.7	Topsoil, highly organic.	OL		6-113-1	D	1.5	6.0	
		0.7	6.0	Sand, silty, gravelly, well graded. Cobbles - 15%.	SW-SM						
6-114	1337.7	0.0	3.5	Topsoil and subsoil, gravelly, silty.	SM		6-114-1	D	3.5	7.5	
		3.5	8.0	Sand, poorly graded, very fine grained.	ML						
6-115	1346.0	0.0	2.0	Sand, silty.	SM		6-115-1	D	3.0	6.0	
		2.0	3.0	Sand, silty, very fine grained.	SM-ML						
		3.0	6.0	Sand, silty, gravelly. Well graded.	SM						

* Disturbed undisturbed rock core † Percent sample recovery

1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist

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LOG OF TEST HOLES

U. S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FF Pub 46

Drilling Equipment Backhoe Location of Holes Borrow - Left Side

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec % †
6-116	1335.7	0.0	1.8	Topsoil	SM		6-116-1	D	3.0	8.0	
		1.8	2.5	Sand, poorly graded, fine grained	SM						
		2.5	8.0	Sand, poorly graded, fine grained.	ML						
6-117	1334.3	0.0	1.7	Topsoil	SM		6-117-1	D	3.5	6.5	
		1.7	3.5	Sand, poorly graded.	SM						
		3.5	6.5	Sand, gravelly, well graded.	SP or GP						
6-118	1330.5	0.0	1.8	Topsoil, sand, silty, gravelly.	SM		6-118-1	D	2.0	7.0	
		1.8	7.0	Sand, silty, poorly graded, fine grained.	SP-SM						
6-119	1328.8	0.0	1.0	Topsoil.	SM		6-119-1	D	1.0	5.0	
		1.0	5.	Sand, gravelly, silty, well graded. Water at 5.0'. Cobbles - 15%.	SM						

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub 46

Drilling Equipment Backhoe Location of Holes Borrow - Left Side

Hole No.	Station and Surface Elev	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. % †
6-120	1326.5	0.0	2.4	Topsoil, gravelly			6-120-1	D	3.7	5.6	
		2.4	3.7	Sand, fine-medium grained, poorly graded.	SP						
		3.7	5.6	Sand, silty, gravelly. Cobbles 15%.	SP-SM						

B-30

* Disturbed undisturbed rock core. † Percent sample recovery.
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

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Form SCS-533
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LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Norfolk, Connecticut Owner _____ State Conn.

Watershed Blackberry River Sub-watershed _____ Site No. 6

Logged by W. M. Brown Date July 1960 Project: WP1 ____ WP2 X FP ____ Pub. 46 ____

Drilling Equipment Backhoe Location of Holes Borrow Areas "B" and "C"

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples USCS	Samples From Ft.	Samples To Ft.	Samples Rec. %
6-122	1335	0.0	1.5	Topsoil				SM			
		1.5	7.0	Gravel, poorly graded, sandy. Cobbles 10"- 20"+ = 30%				GP			
6-123	1324	0.0	1.5	Topsoil				SM			
		1.5	6.5	Sand, fine to medium grained, silty, some coarse angular				SP-			
				rocks, mostly poorly graded. Cobbles - 10" -25-35%.				SM or SM			
6-124	1328	0.0	1.0	Topsoil				SM			
		1.0	6.5	Sand, poorly graded, cobbles 30-40%.				SP			
6-125	1331	0.0	0.9	Topsoil, muck, organic				OL	G-125-1		
		0.9	2.5	Sand, silty, fine to medium grained				SM	2.0	7.0	
		2.5	7.0	Sand, silty, poorly graded, fine to medium grained.				SM			
				Water at 7.0'.							
6-126	1338	0.0	1.0	Topsoil				SM			
		1.0	6.5	Sand, poorly graded, some gravel sizes, less than 5%. cobbles				SP			
		6.5	8.0	Sand, silty, dense, micaceous. Cobbles greater than 5%.				SM			

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

Sheet 21 of 36 Sheets

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Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Norfolk, Connecticut — Owner — State Conn.

Watershed Blackberry River — Sub watershed — Site No. 6

Logged by W. M. Brown — Date July 1960 — Project: WP1 ___ WP2 X — FP ___ Pub. 46

Drilling Equipment Backhoe — Location of Holes Borrow Area "B"

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples XXXX USCS	Samples From Ft	Samples To Ft.	Samples Rec. %
6-127	1330	0.0	1.0	Topsoil, mucky				OL			
		1.0	7.5	Sand, poorly graded, fine to medium grained. Some gravel sizes and cobbles - Water at 7.0'.				SP			
6-128	1339	0.0	1.0	Topsoil							
		1.0	7.0	Sand, poorly graded, some coarse grained. Some cobbles and gravels - 15-20%. Water at 7.0'.				SP			
6-129	1328	0.0	1.5	Topsoil, mucky, organic				OL			
		1.5	3.0	Sand, silty, fine to medium grained. Water at 3.0'.				SM			
6-130	1340	0.0	1.4	Topsoil							
		1.4	7.0	Gravel, poorly graded, Cobbles 10-15%.				GP			
6-131	1340	0.0	1.0	Topsoil							
		1.0	6.0	Gravel, poorly graded.				GP			
		6.0	8.0	Sand, poorly graded, fine to medium grained, no coarse fraction, micaceous.				SP			

* Disturbed undisturbed-rock core. † Percent sample recovery

1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist

Sheet 22 of 32 Sheets

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location [illegible] Owner [illegible] State [illegible]

Watershed [illegible] Sub-watershed [illegible] Site No. [illegible]

Logged by [illegible] Date [illegible] 19 60 Project: WP1 [illegible] WP2 X FP [illegible] Pub. 46 [illegible]

Drilling Equipment [illegible] Location of Holes [illegible]

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Description of Materials	Unif. Soil Class Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec % †
6-132	1330	0.0	0.5	Topsoil							
		0.5	6.5	Gravel, [illegible]	GW						
6-133	1322	0.0	2.0	Topsoil							
		2.0	6.0	Sand, [illegible]	SM						
6-134	1325	0.0	2.0	Muck,	OL						
		2.0	6.0	Sand, very fine grained, gray, micaceous. ML fraction.	ML						

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* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

Sheet 29 of 36 Sheets

Form SCS-533
Rev. Dec 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location: Litchfield County — Owner: — State: Conn.
Watershed: Blackberry River — Sub watershed: — Site No.: 6
Logged by: W. M. Brown — Date: April 1960 — Project: WP1 ___ WP2 X FP ___ Pub 46 ___
Drilling Equipment: Auger Drills — Location of Holes: Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %
6-201	1350.4	0.0	2.0		Overburden							
		2.0	4.0	17	Sand, silty gravelly. Some quartzitic fragments.	SM		1				
		4.0	6.0	11	Sand, gravelly, well graded, grains-angular and quartzitic, brown. Some biotite & Muscovite flakes.	SW		2				
		6.0	8.0	11	Sand, poorly graded, fine to medium grained, light tan.	SP		3				
		8.0	10.0	7	Sand, well graded, fine to coarse grained. Some gravel, Muscovite & biotite, grains-angular.	SW		4				
		15.0	17.0	12	Same as above.	SW		5				
		20.0	22.0	13	Same as above.	SW		6				
		25.0	27.0	12	Same as above.	SW		7				
6-202	1344.4	0.0	5.0		No sample - topsoil 8".							
		5.0	7.0	28	Sand, poorly graded, fine to medium grained. Muscovite. Rounded quartzitic pea gravel.	SP		1				

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* Disturbed-undisturbed-rock core. Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

Sheet 24 of 36 Sheets

CN-408-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. N. Brown Date April 1960 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Acker Drills Location of Holes Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. %
		10.0	12.0	11	Sand, poorly graded, fine to medium grained. Some coarse grained fractions - 5%. Little to no fines. Muscovite.	SP		2				
		15.0	17.0	13	Same as above, somewhat better grading.	SP		3				
6-203	1341.6	0.0	5.0		No sample. Topsoil 8 inches.							
		5.0	7.0	15	Sand, poorly graded, fine to medium grained. Muscovite. Some subrounded gravel sizes.	SP-SM		1				
		10.0	12.0	11	Sand, poorly graded, loose, Muscovite. Fine to medium grained.	SP-SM		2				
		15.0	17.0	17	Same as above.	SP-SM		3				
6-204	1351.0	0.0	2.0		Topsoil, silty sand.							
		2.0	4.0	29	Sand, silty, gravelly. Subrounded rock fragments.	SM		1				
		4.0	6.0	29	Sand, silty gravelly, sand well graded, grains quartzitic and rounded.	SM		2				

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* Disturbed undisturbed rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

CN-408-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 19 60 Project: WP1 ___ WP2 X FP ___ Pub 46

Drilling Equipment Acker Drills Location of Holes Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %
		6.0	8.0	9	Sand, well graded, little or no fines. Some Muscovite.	SW		3				
		8.0	10.0	9	Sand, poorly graded, fine grained. Muscovite. No fines.	SP		4				
		10.0	12.0	13	Same as above	SP		5				
		12.0	14.0	22	Same as above	SP		6				
		14.0	16.0	22	Same as above. Some Muscovite & biotite flakes. Light tan, fine grained. Small rounded quartzitic pieces up to 3/4" 1-5%.	SP		7				
		16.0	18.0	27	Same as above	SP		8				
		18.0	20.0	18	Same as above	SP		9				
		20.0	22.0	No recovery								
		22.0	24.0	32	Same as above	SP		10				
		24.0	26.0	32	Same as above	SP		11				
6-205	1355.6	0.0	5.0		No Sample							
		5.0	7.0	10	Sand, well graded, fine to medium grained. Muscovite. Some 1/2" gravel.	SW		1				
		10.0	12.0	21	Sand, gravelly, well graded, grains-angular and quartzitic. Some Muscovite.	SW		2				

* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist

Sheet 26 of 36 Sheets

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Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project: WP1 WP2 X FP Pub 46

Drilling Equipment Acker Drills Location of Holes Emergency Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft	Hole Depth To Ft	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft	Samples Rec %
		12.0	17.0	28	Gravel, sandy, well graded, little fines, grains-	GW		3				
					angular and subrounded							
		20.0	22.0	19	Sand, poorly graded. Muscovite	SP-SM		4				
		25.0	27.0	22	Sand, poorly graded. Some Muscovite. Fine grained.	SP		5				
		30.0	32.0	24	Sand, fine grained, poorly graded. Some coarse	SP		6				
					grained fraction, some mica.							
6-206	1357.5	0.0	2.0		Topsoil							
		2.0	4.0	20	Sand, well graded, fine to coarse, angular grains,	SW		1				
					brown. Some Muscovite.							
		4.0	6.0	22	Same as above.	SW		2				
		6.0	8.0	15	Same as above, brown, gravelly - 10%.	SW		3				
		8.0	10.0	23	Same as above	SW		4				
		15.0	17.0		No sample							
		20.0	22.0	18	Same as above	SW		5				
		25.0	27.0	20	Same as above	SW		6				
		30.0	32.0	18	Gravelly sand, well graded, angular and subrounded.	SW		7				
		35.0	37.0	11	Sand, poorly graded, fine to medium grained.	SP		8				
					Muscovite. Some 3/4" gravel.							

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* Disturbed undisturbed rock core † Percent sample recovery

1 copy to I and WP Unit, 1 copy Soil Mechanics Laboratory with samples

Other copies as directed by State Conservationist

CN-108-C

Form SCS-533
Rev Dec 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub-watershed Site No. 6

Logged by W. M. Brown Date April 1960 Project. WP1 WP2 X FP Pub 46

Drilling Equipment Acker Drills Location of Holes Emergency and Principal Spillways

Hole No.	Station and Surface Elev	Hole Depth From Ft	Hole Depth To Ft	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %
6-207	1342.1	0.0	2.0		Topsoil							
		2.0	4.0	9	Sand, well graded, fine to medium. Muscovite	SW		1				
		4.0	6.0	19	Sand, poorly graded, fine grained. Some gravel. Muscovite.	SP		2				
		6.0	8.0	8	Sand, gravelly, well graded, fine to coarse angular grains.	SW		3				
		8.0	10.0	11	Same as above but with some quartzitic fragments.	SW		4				
		15.0	17.0	11	Sand, well graded, fine to medium angular grains. Some Muscovite.	SW		5				
6-301	1301.6	0.0	2.0		Muck and organic silty sand							
		2.0	4.0	53	Sand, silty, gravelly	SM		1				
		4.0	6.0	26	Gravel, silty, sandy. Some rock fragments.	GM		2				
		6.0	8.0	41	Same as above	GM		3				
		8.0	10.0	43	Same as above	GM		4				
		10.0	12.0	38	Same as above	GM		5				
		15.0	17.0	39	Sand, well graded	SW		6				
		20.0	22.0	34	Sand, gravelly, well graded	SW		7				

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* Disturbed-undisturbed-rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

CN-408-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County Owner State Conn.

Watershed Blackberry River Sub watershed Site No. 6

Logged by W. M. Brown Date April 19 60 Project: WP1 WP2 X FP Pub. 46

Drilling Equipment Acker Drills Location of Holes Principal Spillway

Hole No	Station and Surface Elev	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. % †
6-302	1300.4	0.0	2.0		Muck							
		2.0	4.0	No recovery	Loose silty sand and gravel							
		4.0	6.0									
		6.0	8.0	44	Sand, silty, poorly graded, fine. Some gravels.	SM		1				
		8.0	10.0	43	Same as above.	SM		2				
		10.0	12.0	45	Sand, poorly graded. Gravel fraction..	SP		3				
				No recovery	Artesian Conditions							
		12.0	14.0									
		14.0	15.5	75	Sand, gravelly, silt	SM		4				
		20.0	22.0	75	Sand, silty, gravelly	SM		5				
		25.0	27.0	59	Same as above.	SM		6				
		30.0	32.0	42	Same as above.	SM		7				

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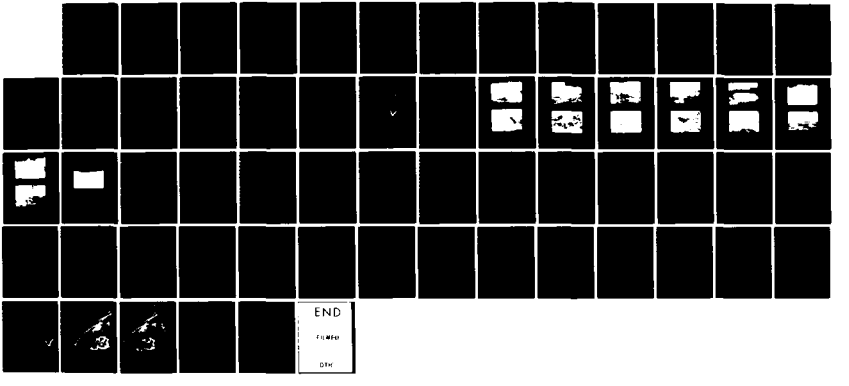
* Disturbed undisturbed rock core. † Percent sample recovery.
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist.

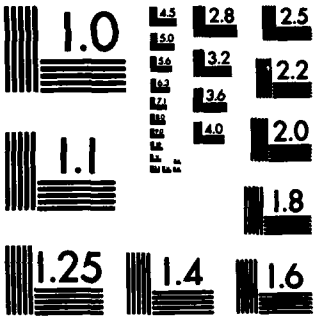
Sheet 21 of 25 Sheets

CN-108-G

AD-A144 566 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
NORFOLK BROOK DAM (CT.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

UNCLASSIFIED F/G 13/13 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location: Litchfield County | Owner: | State: Conn.
Watershed: Blackberry River | Sub watershed: | Site No: 6
Logged by: W. H. Brown | Date: April 1960 | Project: WP1 ___ WP2 X ___ FP ___ Pub. 46 ___
Drilling Equipment: Acker Drills | Location of Holes: Principal Spillway

Hole No	Station and Surface Elev	Hole Depth From Ft	Hole Depth To Ft	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec.† %
6-303	1298.8	0.0	2.0	3	Mucky, highly organic silty sand and gravel	OL		1				
		2.0	4.0	36	Sand, silty, gravelly, poorly graded, fine to medium grained.	SM		2				
		4.0	6.0	56	Gravel, silty, sandy, poorly graded, fine grained. Fragmental rock from cobbles and large gravels.	SM		3				
		6.0	8.0	50	Sand, gravelly, well graded	SW		4				
		8.0	10.0	57	Gravel, silty, sandy, poorly graded, fine grained. Fragmental rock from cobbles and large gravels.	SM		5				
		10.0	12.0	48	Same as above.	SM		6				
		12.0	14.0	63	Same as above but with yellow mica.	SM		7				
		14.0	16.0	52	Same as above.	SM		8				
		20.0	22.0	38	Sand and gravel, well graded, angular grains, gravel-subrounded. Some Muscovite.	SW		9				
		25.0	27.0	35	Gravel, silty, sandy, fine to medium grained	SM		10				
		30.0	32.0	59	Sand, silty, gravelly, fine grained with some angular coarse grains	SM		11				
		35.0	37.0	58	Same as above but with more silt.	SM		12				
		40.0	42.0	59	Gravel, silty, sandy.	GM		13				

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* Disturbed-undisturbed-rock core. † Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist.

Sheet 30 of 32 Sheets

CN-108-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location: Litchfield County — Owner: — State: Conn.
Watershed: Blackberry River — Sub watershed: — Site No. 6
Logged by: W. M. Brown — Date: April 1960 — Project: WP1 — WP2 X — FP — Pub. 46
Drilling Equipment: Acker Drills — Location of Holes: Principal Spillway

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class Symb.	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec %†
6-304	1297.4	0.0	4.0		Muck and silty sand							
		4.0	6.0	12	Sand, gravelly, well graded, angular	SW		1				
		6.0	8.0	15	Gravel, silty, sandy	GM		2				
		8.0	10.0	35	Gravel, sandy, well graded, angular grains	GW		3				
		10.0	12.0	35	Sand, gravelly, well graded. Muscovite.	SW		4				
		12.0	14.0		No sample - Plugged spoon							
		14.0	16.0	36	Sand, gravelly, well graded. Muscovite and yellow mica.	SW		5				
		20.0	22.0	49	Sand, silty, gravelly, poorly graded	SP-SM		6				
		25.0	27.0	45	Same as above	SP-SM		7				
		30.0	32.0	41	Sand, gravelly, poorly graded, fine grained.	SP		8				
6-305	1296.3	0.0	3.0		Muck and fine organic silty sand	OL						
		3.0	5.0	26	Gravel, silty, sandy. Some Muscovite. Fragmental rock.	SM		1				
		5.0	7.0	28	Same as above	SM		2				
		7.0	9.0	20	No recovery							
		9.0	11.0	10	Sand, gravelly, well graded	SW		3				
		11.0	13.0	24	Gravel, silty	SM		4				
		13.0	15.0	34	Same as above	SM		5				

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* Disturbed-undisturbed-rock core. † Percent sample recovery
1 copy to E and WP Unit, 1 copy Soil Mechanics Laboratory with samples.
Other copies as directed by State Conservationist

Sheet 31 of 32 Sheets

CN-408-G

Form SCS-533
Rev. Dec. 58

LOG OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Location Litchfield County | Owner | State Conn.
Watershed Blackberry River | Sub-watershed | Site No. 6
Logged by W. M. Brown | Date April 1960 | Project: WP1 | WP2 X | FP | Pub 46
Drilling Equipment Acker Drills | Location of Holes Dike Centerline

Hole No.	Station and Surface Elev.	Hole Depth From Ft.	Hole Depth To Ft.	Blows per Ft.	Description of Materials	Unif. Soil Class. Symb	Type Bit Used	Samples No.	Samples Type*	Samples From Ft.	Samples To Ft.	Samples Rec. %
		20.0	23.0	67	Same as above. (refusal)	GM		6				
6-601	1323.7 2+23	0.0	0.5		Muck							
		0.5	10.0		Bedrock - fine grained biotite gneiss		Dia.	1				95
6-602	1312.7 1+40	0.0	2.0	9	Mucky topsoil for 1'.0" (OL). Sand, silty, wet.	OL		1				
					Some fragmental rock	SM						
		2.0	4.0	41	Sand, silty, poorly graded, very fine, Micaceous. Fragmental and subround rock	SM		2				
		4.0	5.8	115	As above with cobbles & fragmental rock up to 5.9'.	SM		3				
		5.9	7.0		Decomposed biotitic gneiss and gneiss fragments.							
					102 blows for this 1.1'.							
		7.0	18.0		Bedrock - coarse biotite gneiss		Dia.					82
6-603	1324.9 0+65	0.0	2.0	7	Sand, silty, gravelly, fine grained	SM		1				
		2.0	4.0	21	Sand, gravelly, poorly graded. Brown, Muscovite.	SP-SM		2				
		4.0	6.0	28	Same as above but with 10% gravel	SP-SM		3				
		10.0	12.0	68	Same as above.	SP-SM		4				
		16.0	18.0	31	Sand, poorly graded, fine grained, little gravel.	SP-SM		5				

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* Disturbed undisturbed rock core. ** Percent sample recovery.
1 copy to E and WP Unit. 1 copy Soil Mechanics Laboratory with samples
Other copies as directed by State Conservationist

Sheet 32 of 36 Sheets

CN-108-G

N. M. Kautz

DEC 5 1960

S. J. Smith, State Conservation Engineer,
SCS, Storrs, Connecticut

December 1, 1960

Ray S. Decker, Head, Soil Mechanics Laboratory,
SCS, Lincoln, Nebraska

Connecticut WP-2 -- Norfolk Brook, Site No. 6

Kautz
Smith
Tindall
Hull
Shalk
Clark
McKeever
Karban
Posner
Hunt
Grubb
Chan
Hall
Kessler
Riley
Cain
Calvin

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 1 sheet.
2. Form SCS-355, Triaxial Shear Test Data, 2 sheets.
3. Form SCS-352, Compaction & Penetration Resistance Report, 4 sheets.
4. Form SCS-353, Gradation of Borrow Area Materials, 5 sheets.
5. Form SCS-353, Drain Material Specifications, 1 sheet.
6. Form SCS-357, Summary - Slope Stability Analysis, 1 sheet.
7. Form SCS-372, Recommended Use of Excavated Material, 1 sheet.
8. Figure 1, Seepage Analysis, 1 sheet.
9. Investigational Plans and Profiles.

DISCUSSION

A. FOUNDATION:

1. Classification: This site is in an area of glacial deposits which consist of stratified and non-stratified sands and gravels.

Gradations of the samples submitted from the foundation, at depths below 2' to 4' of surface organic material, are poorly graded sands, SP; poorly graded gravels, GP; and sands containing some silt fraction, SM.

A water table was encountered at variable depths across the flood plain. At Station 2+25 between the elevations of 1267 and 1274, a hydrostatic head was encountered which flushed sand into the cased hole. At a distance of 60' upstream from Centerline Station 2+80, hydrostatic pressure was encountered at elevation 1288 which caused artesian flow from the top of the casing.

2. Densities: Standard penetration (blow count) tests were taken throughout the foundation. Blow count ranged from 6 blows per foot for most surface material to 75 blows per foot for most substrata. These blow counts indicate dry densities of 105 to 150 p.c.f. for SM material. On the basis of the blow count data, foundation densities should average 110 to 115 p.c.f. (dry weight).

3. Permeability: Permeability rates estimated from blow count and effective size of foundation materials are shown on Form SCS-354.

Estimated permeability rates of foundation materials range from 80 ft./day for GP material represented by Sample 61W321 (6-5-1) with average blow count of 8 per foot in the strata from 6' to 15' below the surface to 1' or 2' per day for SM or SP materials with blow counts of 30 to 50 underlying the principal spillway location.

4. Consolidation: The consolidation potential of the foundation should be low and practically all consolidation should be complete at the end of the construction period. Based on blow count and estimated densities along the proposed principal spillway location, a total consolidation potential of 0.3' may be expected under the maximum section. This is based on correlations with materials previously tested here at the Soil Mechanics Laboratory.

5. Shear Strength: On the basis of densities estimated from blow count data, foundation strength should be adequate for the proposed structure. Low blow count materials shown between depths of 6' and 15' in t hole 5 should consolidate sufficiently during construction to provide adequate strength.

B. EMBANKMENT MATERIALS.

1. Classification and Compacted Densities: Four samples of proposed borrow materials were submitted for testing. These materials classed as SP from the emergency spillway, Borrow Area A; SM from part of Borrow Area B and GW from other parts of Borrow Area B; and SM from Borrow Area C.

Review and analyses of geologic logs and field sieve analyses indicate the possibilities of sub-dividing presently indicated borrow areas and adding new borrow areas.

Possible borrow areas and moisture-density relationships are listed as follows:

Borrow Area	Classification	Test Holes	Samples	Max. Std. Dens. on #4	Opt. H2O
A	SP & GW	Emergency Spillway	61W325 (6-102-1)	121	11.5
B-1	SM	125, 126, 127	61W327 (6-125-1)	132	15
B-2	GP & GW	123, 130, 131, 132	61W328 (6-130-1)	116.5	9.5
C-1	SM & ML	108, 110, 118, 133, 134	6-108 6-118 6-133	Estimated 105-110	12-16
C-2	SP & SM	106, 107, 120, 122, 124	61W326 (6-120-1)	110	13
C (new)	SM & ML	113, 114, 115, 116	6-116	Estimated: 100-105	12-18

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Roy S. Decker
Subj: Connecticut WP-2 -- Norfolk Brook, Site No. 6

Standard Proctor densities shown in the above table are based on the fraction passing No. 4 screen.

All available gradation data for samples from each borrow area were grouped and plotted for individual borrow areas on attached Forms SCS-353.

Corrected dry densities for variable percentages of material larger than the #4 sieve were computed and are shown on the Compaction and Penetration Resistance Reports, Form SCS-352.

The following are maximum computed dry densities as represented by samples received:

Sample No.	Classification	Borrow Area	% > #4	Max. Dry Density	Optimum Moisture
61W325	SP	A	35	125	8.0%
61W326	SM	C-2	25	119.0	9.5%
61W327	SM	B-1	4	102.0	15.0%
61W328	GW	B-2	60	139.0	4.0%

Dry densities and optimum moistures shown on the attached Form SCS-354 are for materials passing the #4 sieve.

2. Shear Strength: Triaxial shear tests were performed on Samples No. 61W327 and 61W328. These materials were tested at near 95% of maximum Standard Proctor dry density.

Sample 61W327 (SM) was tested with 1.4" diameter specimen on minus #4 material. Sample 61W328 (GW) was tested using material passing 1" in diameter and 4" diameter specimen.

The grading characteristics of the 4" shear specimen are shown on Form 354. You will note that the % of fines in the natural sample was returned in the regraded sample.

All tests were performed on saturated specimen.

You will note that design values selected from these tests are conservative, 61W327 with $\phi = 35°$ and $c = 0$ and 61W328 with $\phi = 41°$ and $c = 0$. The total envelope for Mohr's circles on tests for 61W328 would give values of $\phi = 45°$ and $c = 2$ p.s.i.

3. Permeability: Compacted permeability tests were run on three borrow samples: SP - 61W325, SM - 61W327, and GW - 61W328.

Due to the shortage of samples, materials from shear tests had to be reused for permeability tests. These tests were therefore quite delayed.

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Samples 325 and 328 were regraded to represent the same percentage of fines as the original samples, with all materials passing the 3/4" or 1" screen.

Results for various gradations and densities are shown on Form 354. You will note that the SM from Borrow B-1 and the GW from Borrow B-2 compacted to 95% of maximum dry densities adjusted for the % oversize material in the sample submitted gave almost identical permeability rates of 3 ft./day.

The SP from the emergency spillway (61W325) was originally compacted to 95% of maximum density adjusted for 35% oversize material with maximum size particle of 3/4". This test produced rates lower than the GW and SM (1.12 ft./day). These tests were repeated using material passing 1" screen, regraded in accordance with the original sample and compacted to about 90% of maximum adjusted standard density. These latter tests gave rates of 4.5 to 10 ft./day depending upon density.

Permeability tests were not run on SM Sample 61W326. This material should give rates about like SM - 61W327.

According to our tests, all of the borrow samples submitted will have about the same permeability rates when compacted to 95% of maximum standard density adjusted for the percentage of oversized material present.

ML materials in proposed Borrow Areas C-1 and D should be considerably less pervious.

SLOPE STABILITY:

1. Modified Swedish Circle: An analysis of the embankment at Centerline Station [illegible] was made by the modified Swedish circle method. This analysis was made with a zoned embankment of SM in the center section and GW in the shells. The phreatic line was assumed to be controlled by a drain at the downstream toe of the center section. On the basis of our permeability tests, such a drain will be required.

The design data and dam dimensions used for the stability analysis are shown on Fig. 354. This analysis indicates the need for 3:1 upstream slope and 2 1/2:1 downstream slopes for adequate safety of a damage class "c" structure.

The application of this method of slope analysis is not exactly applicable to non-cohesive materials. Other methods of analysis were used as a check on the above method. The results of these analyses are discussed as follows:

2. Sliding Wedge Analysis: Dimensions and design data for this analysis were as follows:

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Subj: Connecticut WP-2 -- Norfolk Brook, Site No. 6

a. Center core section = SM-SP-ML. Slopes 1:1; γ_m = 109 p.c.f., γ_s = 119 p.c.f., ϕ = 35°, c = 0.

b. Outside shells = GP-GW. Slopes = 3:1 upstream, 2:1 downstream; γ_m = 131, γ_s = 139, ϕ = 41°, c = 0.

c. Phreatic line from emergency spillway to point on downstream slope at elevation 1314.8.

d. Sudden drawdown forces considered in upstream section on basis of compacted permeability tests.

This analysis produced safety factors of 2.18 for upstream section and 2.48 for the downstream section.

3. Glover-Cornwell Method (ASCE Proc. Nov. 1941 and U.S.S.R. Treatise on Dams - Chapter 8, Earth Dams): The following data for steepest stable slopes of saturated cohesionless materials are taken from the U.S.S.R. publication. These values consider seepage pressures developed during sudden drawdown and/or steady seepage conditions for homogeneous fills.

Saturated Density lb./ft.^{3}	Coefficient of friction		
	.60	.90	.80
	Steepest stable slope		
120	3.8:1	3.3:1	3.0:1
127.5	3.5:1	3.1:1	2.8:1
135	3.4:1	3.0:1	2.6:1
142.5	3.2:1	2.8:1	2.5:1

Our recommendations for design of this dam will include selective placement of materials with SM, SP and ML in the center section and GP-GW in the outside sections. The heterogeneity of the natural borrow materials will result, however, in considerable variance in field density and shear strength of materials as finally placed in the fill.

Variations in the fine borrow will probably give saturated densities of 120 to 135 p.c.f. with tan ϕ values of .65 to .75. Variations in the gravelly borrow will probably result in saturated densities of 127.5 to 142.5 p.c.f. with tan ϕ values of .7 to .85.

With placement recommendations for as much fine material as possible in the upstream section and as much coarse material as possible in the downstream section, the following deductions can be made from the above slope design data:

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Upstream section: Avg. $\gamma_{sat.}$ = 125
Avg. tan ϕ = .75
Stable slope = 3:1

Downstream section: Avg. $\gamma_{sat.}$ = 140
Avg. tan ϕ = .80
Stable slope = 2.5:1

The above slope design values correspond with those computed from the Swedish circle method and also compare with those from the sliding wedge method.

D. SEEPAGE ANALYSIS:

Approximate analyses to determine uplift pressure at the toe of the dam were made by methods presented by Bennett (Soil Mechanics Conference, Lincoln, Nebr., Nov. 14-17, 1960). Assumptions for the analysis are given on Fig. 1 attached. It is felt that all assumptions except depth of aquifer (D) are on the conservative side.

You will note that two pressure gradient lines were computed, one for no foundation relief drain and one with a trench drain extending 10' into the foundation.

Full pressure gradients were computed on the basis of 53' of total head: 33' at full reservoir and 20' of existing artesian pressure.

The amount of fill required to balance the excess hydrostatic pressure at the ground surface near the toe of the dam was computed using fill material with moist weight of 135 p.c.f. This fill material should be pervious and may be coarse gravel and/or boulders.

Alternate 1

It is felt that the design using 2:1 downstream slope with 4 to 1 toe fill taking off at about mid height of the dam, which is well above the outcrop elevation of a full phreatic line, combined with a trench drain 5' wide by 10' deep at the toe of the semipervious fill connected to a rock toe by means of a 4' thick blanket of clean sand and gravel drain material is the most practical.

Alternate 2

The computations show that a toe fill on 4.8:1 slopes taking off at mid height of the dam should balance out the uplift pressure. It is felt, however, if such design is used, that the blanket drain should extend upstream to a point where the ratio c/b = .5. At this point, the proposed height of fill has sufficient weight to balance uplift.

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Rough computations indicate that less gravel filter or drain material will be required for Alternate 1 than for Alternate 2.

Horizontal blanket drains in either alternate should be outletted into rock and cobble toe sections.

Foundation drainage and stability above the berm or toe fill should be accomplished by means of a rock toe placed on a gravel blanket 1.5 to 2' thick. The rock toe should be 4' thick at elevation 1317 and grade out at elevation 1333.

E. CONCLUSIONS AND RECOMMENDATIONS:

1. Site Preparation: All material described as organic muck under the flood plain section of the dam should be removed. These materials should be spread on the abutments upstream from the dam.

The abutments should be shaped to slopes of 2:1 prior to placement of embankment.

Top soil and muck cover upstream from the dam should be disturbed as little as possible.

2. Cutoff: A positive cutoff is not feasible. Removal of the muck should provide adequate keyway across the valley section. A shallow 3' to 4' keyway should be placed in the abutments to insure bond between embankment and foundation.

3. Principal Spillway: Artesian flow was encountered in T.H. 302, along the proposed centerline of the principal spillway.

Artesian conditions were also found in T.H. 5. It would appear that an old channel may exist in the area between holes 302 and 5.

It is suggested that the principal spillway location be rotated about 8° to the left around hole 304, as shown on Form 35a, Sheet 1 of 3. This will require some additional excavation around the inlet but should eliminate the potential piping hazards from the artesian pressures.

The conduit trench should be overexcavated at least the diameter of the conduit and backfilled with compacted material to provide a more uniform bedding under the conduit.

Backfill material under and around the conduit should be the most plastic available - probably ML from Borrow Areas C-1 or D.

A camber of 0.5' should be adequate for consolidation under the conduit.

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4. Settlement: Settlement of the embankment materials and consolidation in the foundation after construction are expected to be small. An overfill of 0.5' appears adequate to compensate for residual settlement.

5. Embankment Slopes: The following slopes are recommended:

Upstream: 3:1 with 10' berm at elevation 1304.

Downstream: 2:1.

Downstream berm or toe fill: Slope of 4 to 1 from base to elevation 1317.

6. Embankment Placement: Selective placement of materials should be followed as closely as practicable with GP and GW from Borrow Area B-2 in the upstream and downstream sections and SM, ML, SP from Borrow Areas B-1, C-1 and D in the center section.

SP-SW material from emergency spillway, Borrow Area A and Borrow C-2 can be used in the downstream portion of the center section.

If at all possible, material for the downstream toe fill should consist of boulders, rocks and coarse gravel ranging in size from 10 to 12" to 1/2 or 3 1/4".

If rock is not used in the downstream toe fill or berm, the soil material should be carefully selected coarse GP or GW. All rocks and boulders larger than 6" diameter should be raked or otherwise moved to the outside edges of the dam.

Materials should be placed at 95% of maximum standard Proctor densities corrected for the actual percentage of material larger than No. 4 size.

Recommended sources of material and placement densities are shown on Form 372.

7. Drainage:

a. A foundation trench drain at the toe of the 2:1 downstream slope is recommended between elevation 1317. The trench should extend at least 10' into the foundation. It should be backfilled with filter drain material meeting gradation requirements shown on Form 353.

The trench drain should be outletted to a rock toe by means of a horizontal blanket of filter material 3 to 4' in thickness.

This drainage system (Alternate No. 1) is preferred over Alternate 2 (flatter toe slopes and blanket drain without trench) because of:

(a) The stratification in the foundation, (b) unknown relationships between horizontal and vertical permeability rates of foundation, and (c) the possibility that some of the more pervious foundation strata are blocked downstream from the proposed structure. All of these features definitely influence the effectiveness of a blanket drain. The trench drain will at least relieve the uplift pressures in the upper foundation strata, thereby moving any critical uplift area downstream from the dam.

b. Blanket and filter material.

Specifications for drain material are shown on Form 354. The gradation specifications are based upon foundation samples 61W321 (hole 5), 322 (holes 302, 303, 305) and borrow sample 328. Criteria used are 12 to 40 x D_{15} of fine base and 12 to 58 x D_{50} of fine base. You will note that the minimum D_{15} of the drain material does not quite meet the permeability criteria of D_{15} = 5 x D_{15} coarsest base but should be adequate.

With the recommended specifications, much of the presently available material will pass if it is screened through a No. 10 screen with the fines discarded. The GW from Borrow B-2 and the GP from foundation hole 5 would both fall within the limits if the fraction passing a No. 10 screen was removed.

Standard road gravel No. 89 would also be acceptable but this gradation is on the fine side with 100% passing 1/2" screen.

c. Rock toe: Material in the rock toe or berm should be graded such that 15% are smaller than 6 inches but not smaller than 3/4" in diameter (D_{15} = 3/4" to 6.4").

d. Drainage above elevation 1317: A rock toe drain placed on 1.5 to 2' of drain blanket material should take care of seepage through the abutments above the toe fill or berm. The rock toe should be 4' thick at elevation 1317 and grade to nothing at elevation 1333.

8. Special Considerations:

a. Most of areas C-1 and C-2 are below high water elevation. If these borrow areas are used, the organic top soil should be stockpiled and spread back over the borrow pits. The sides of the borrow pits should be sloped to at least 3:1 to facilitate re-surfacing.

b. Since seepage analysis of this project can only be approximate due to material variations and lack of natural permeability information, it is

suggested that piezometers be installed along the downstream toe of the dam to evaluate seepage and uplift conditions during high stages of the reservoir.

9. Secondary Dike: It is recommended that the secondary dike be constructed like the main fill - that is, with selective placement of SM & ML materials in the center section and GP-GM materials in the outside sections.

Special drains should not be necessary except in the right abutment where a rock toe on a gravel blanket as suggested for the main dam above elevation 1317 should be adequate.

A positive cutoff to rock should be constructed across the bottom and up the left abutment.

10. The geologic investigation of this site was very good and Mr. Brown should be complimented.

Prepared by:

Attachments

Rey S. Decker

cc: H. M. Kautz, Head, E&WP Unit, Upper Darby, Pa.
H. Paul Tedrow, State Conservationist, Storrs, Conn.
W. M. Brown, Geologist, Storrs, Conn.
S. J. Smith (1 copy)

O.K.
RJ.

CONNECTICUT BLACKBERRY RIVER W.S. CO-4

11/2/59 WTF 11/2/59 SITE #6

7

HYDROGRAPH COMPUTATIONS - DIANE STORM - 1955

W.S. AREA - 1.0 SQ. MILE

T_c - 2.8 HRS

I CURVE - 67 II CURVE #5

T_p - .5 + .6 T_c = 2.2 HRS

POINT RAINFALL - 8.51 INCHES

T_b - 2.67 x 2.2 = 5.9 HRS

$q_u = \frac{484 \times 1.0}{2.2}$ = 220.0 CFS

TIME	ENDING TIME	RATIO	ACCUM P	ACCUM R	ΔQ	220 ΔQ	T_s	T_p	T_b
0	0		0	0					
					0		0	2.2	5.9
1	.43	.03	.26	.07					
					.03	6.6	1	3.2	6.9
2	.86	.057	.57	.15					
					.12	26.4	2	4.2	7.9
3	1.29	.141	.94	.46					
					.31	68.2	3	5.2	8.9
4	1.71	.174	1.45	1.45					
					.99	217.8	4	6.2	9.9
5	2.14	.270	2.51	3.56					
					2.11	464.2	5	7.2	10.9
6	2.57	.611	5.20	4.29					
					.73	160.6	6	8.2	11.9
7	3.00	.703	5.98	4.80					
					.51	112.2	7	9.2	12.9
8	3.43	.765	6.51	5.21					
					.41	90.2	8	10.2	13.9
9	3.85	.817	6.95	5.58					
					.37	81.4	9	11.2	14.9
10	4.28	.863	7.34	5.90					
					.32	70.4	10	12.2	15.9
11	4.71	.902	7.68	6.18					
					.28	61.6	11	13.2	16.9
12	5.14	.936	7.97	6.19					
					.28	61.6	12	14.2	17.9
13	5.57	.959	8.20	6.46					
					.25	55.0	13	15.2	18.9
14	6.00	1.000	8.51	6.71					

CONN BLACKBERRY RIV. W.S.

DTB 16 DEC 60 SITE NO. 6

DESIGN HYDROGRAPH COMP 8

DR AREA = 1.0 SQ MI DIST CURVE "B"

RUNOFF = 13.5" = P Q HYDROGRAPH FAMILY NO 2

T_c = 2.8 III CURVE = 89.5 (AJ 85)

P = 15.9 IN (EQ 1001 FIG 3.1-1) $T_p = .7 T_c = 1.96$

T_r = 5.63 T_r/T_p = 2.10 (AJ 3) ; $R_{eq}\ T_p = \frac{5.37}{3} = 1.39$

$q_p = \frac{484 (1.0)}{1.96} = 256$ CFS $Q_{3p} = 346$ CFS

$T_{curve} = (t/T_p, R_{eq}\ T_p)$ $q_{curve} = (q/q_p) Q_{3p}$

LINE NO	T	q	LINE NO	T	q
1	0	0	15	9.27	163
2	.66	17.3	16	9.94	97
3	1.32	93.5	17	10.60	55.4
4	1.99	350	18	11.25	31.1
5	2.65	804	19	11.91	17.3
6	3.31	1951	20	12.55	10.?
7	3.97	2251	21	13.20	6.1
8	4.63	1990	22	13.90	3.5
9	5.30	1590	23	14.53	0
10	5.95	1215			
11	6.62	1012			
12	7.28	875			
13	7.95	439			
14	8.60	210			

Conn Blackberry River

PBG 6/14/60 WTF 6/15/60

Design Hydrograph Computations 9

2.5 Times the 6 hour Pr. Rainfall

Runoff Condition II — Dist. Curve S

Runoff Curve No – 67 ✓ — Hydrograph Fig. 2

Storm Duration = 6 hrs. — Areal Rainfall = 23.0 ?

Dr. Area = 1 sq mi — Computed T_p = 1?. ??

T_c = 2.8 hrs — T_p = 3.41 hrs.

Q = 18.0 in — $T_s/T_p = \frac{2.41}{1.71} = 2.76$ —

$q_c = \frac{484.0}{180} = 2.69$ cfs — USE S

Q_{gp} = 5760 cfs — K = T_t = 1.00 —

line no.	t	q	line no.	t	t	line no.	t	q
1	0	0	13	6.91	1042.4	25	13.82	0
2	.58	15.1	14	7.49	682.1			
3	1.15	86.0	15	8.06 ✓	440.2 ✓			
4	1.73	470.6	16	8.64	273.2			
5	2.30	1573.7	17	9.22	161.9			
6	2.88	2691.8	18	9.79	96.1			
7	3.46 ✓	3111.9 ✓	19	10.36	60.7			
8	4.03	2909.5	20	10.94	40.5			
9	4.61	2464.2	21	11.52	25.3			
10	5.18	2069.5	22	12.10	15.1			
11	5.76	1749.0	23	12.67	10.1			
12	6.34	1411.7	24	[illegible]	[illegible]			

WATER RESOURCES UNIT - D.E.P.

OPERATION AND MAINTENANCE INSPECTION REPORT

PROJECT: Norfolk - Norfolk Brook Site 6 DATE: August 13, 1979

INSPECTION PARTY: A. Cross, Soil Conservation Service; and A. Roberts, V. Galgowski, Department of Environmental Protection

ITEM	CONDITION S or U*	MAINTENANCE OR REPAIRS REQUIRED	DATE COMPLETED
I. Embankments			
A. Vegetation	S		
B. Rip rap	S		
C. Drains	S		
II. Principal Spillway			
A. Trash rack	S		
B. Gates	S		
C. Stilling Basin	S		
D. Conduit	S		
III. Emergency Spillway			
A. Vegetation	S		
B. Obstructions	S		
IV. Outlet Channels			
A. Slope protection	S		
B. Debris	S		
V. Reservoir Area			
A. Debris	S		
B. Stop logs	N/A		
VI. Miscellaneous			
A. Access road	S		
B. Fences	N/A		

Remarks: The vetch cover on the embankment appears to be dying. Soil Conservation Service staff will be asked to evaluate the cause and suggest remedy.

Inspected by: Victor F. Galgowski Title Supt. of Dam Maintenance

* S = Satisfactory
U = Unsatisfactory
NA = Not applicable

APPENDIX C

PHOTOGRAPHS

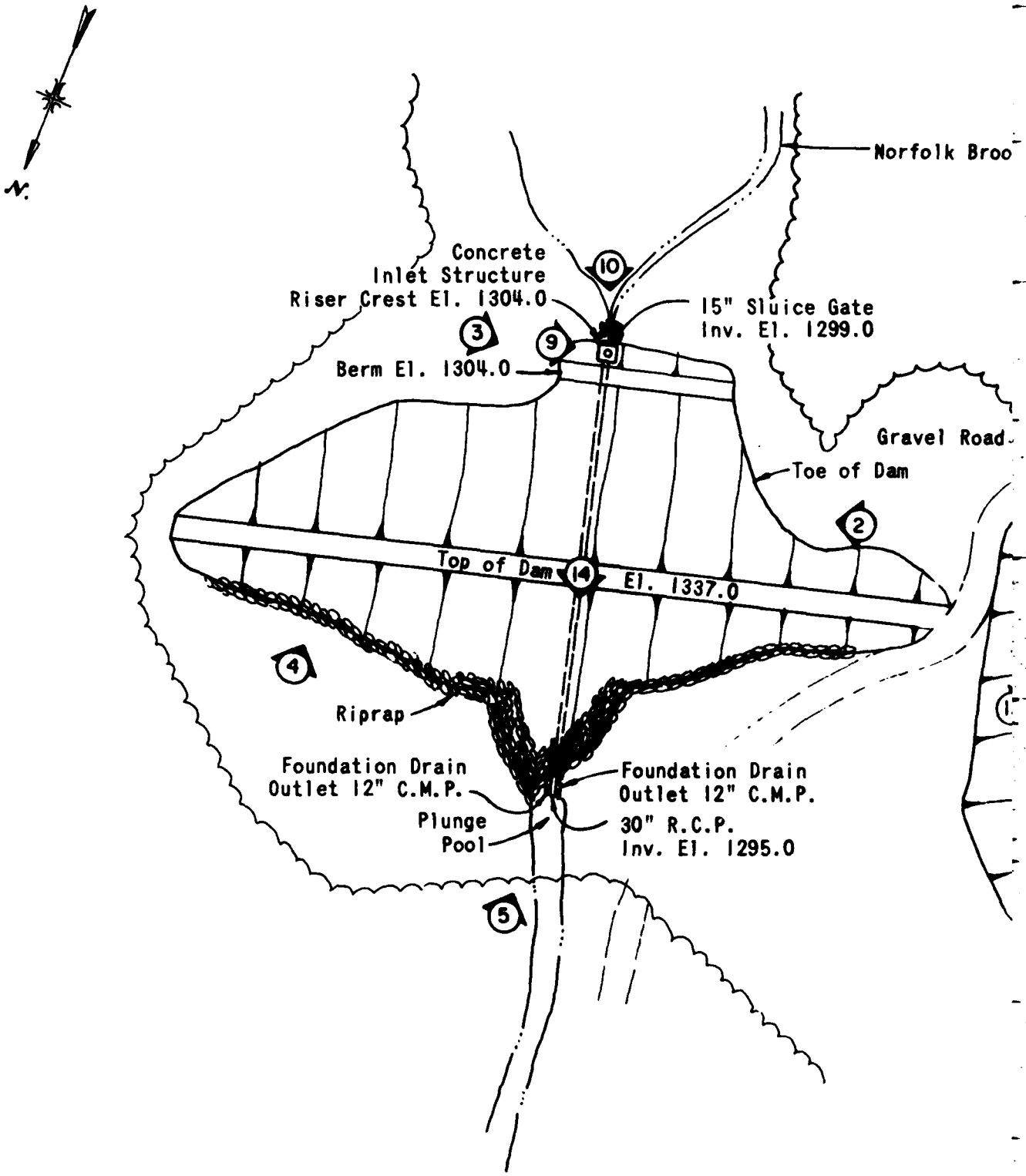
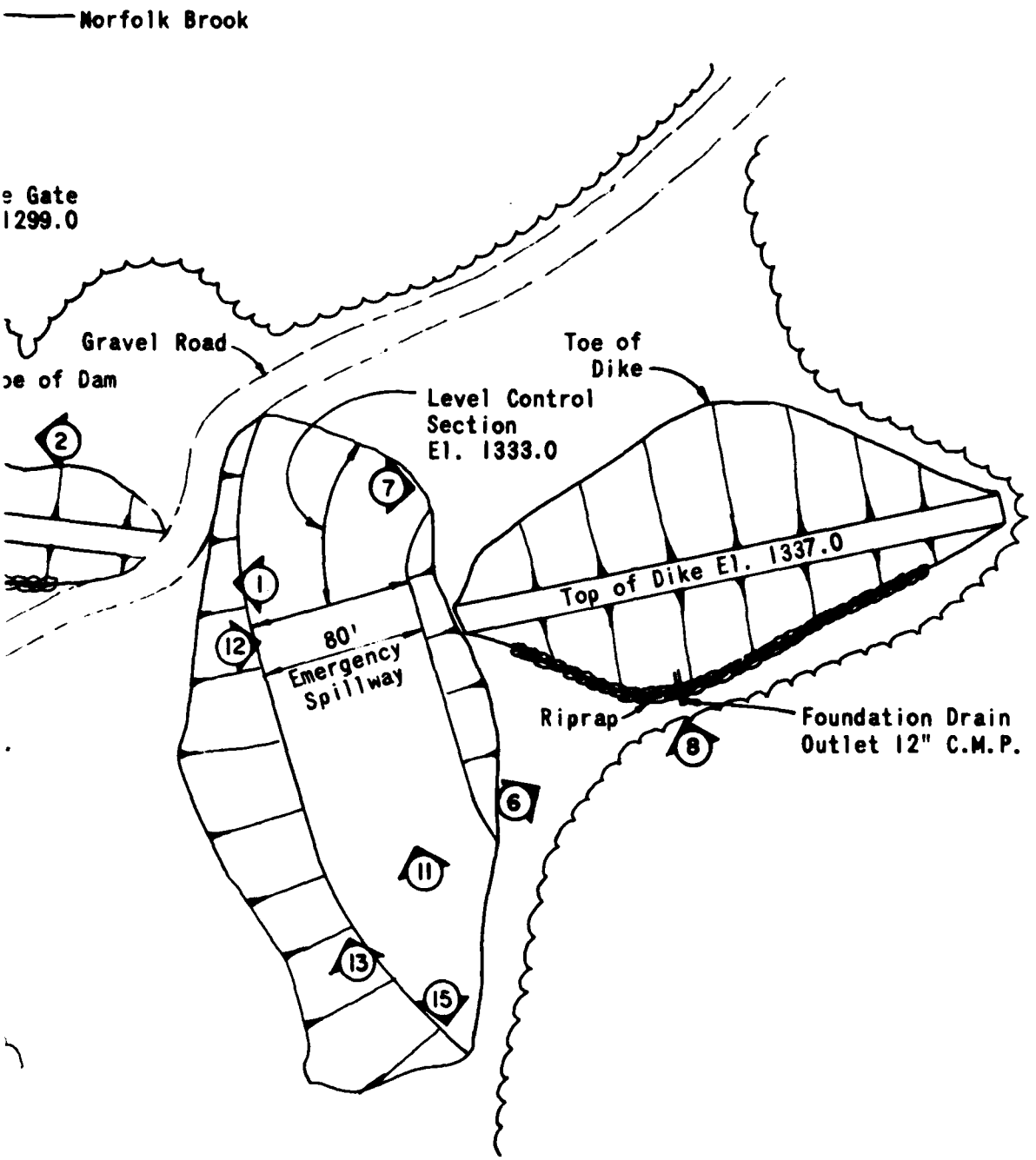

N.
Norfolk Broo
Concrete
Inlet Structure
Riser Crest El. 1304.0
15" Sluice Gate
Inv. El. 1299.0
Berm El. 1304.0
Gravel Road
Toe of Dam
Top of Dam
El. 1337.0
Riprap
Foundation Drain
Outlet 12" C.M.P.
Plunge
Pool
Foundation Drain
Outlet 12" C.M.P.
30" R.C.P.
Inv. El. 1295.0
Denotes photo number and
direction in which photo was
taken.

FIGURE 2



ROALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PHOTO LOCATION PLAN
NORFOLK BROOK DAM
NORFOLK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES	1" = 80'
JRS	DLS	RH	DATE 2/81	PAGE C-1

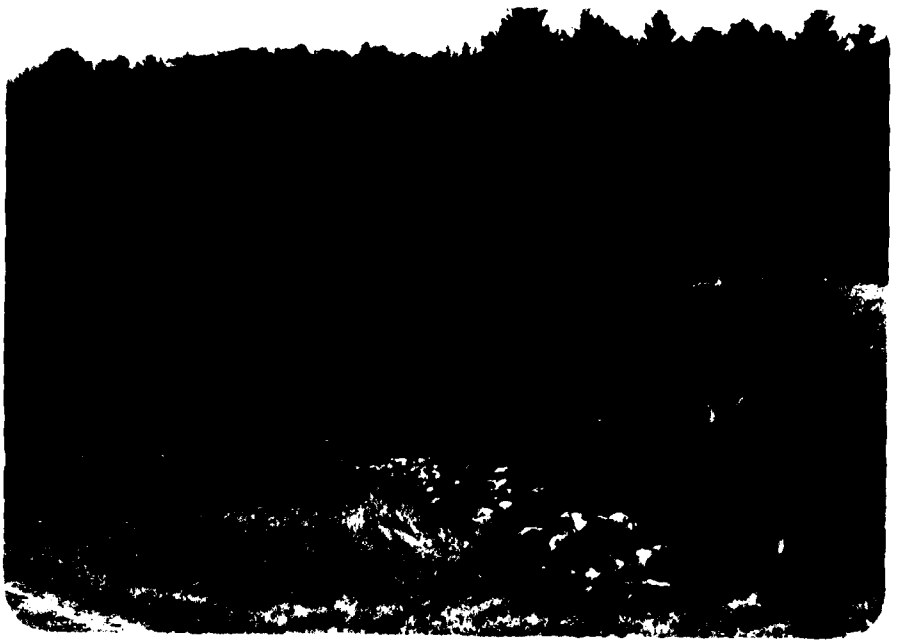


PHOTO NO. 1

DOWNSTREAM SLOPE OF DAM. NOTE
RIPRAP AT TOE OF SLOPES.



PHOTO NO. 2

UPSTREAM SLOPE OF DAM LOOKING
AT THE RIGHT ABUTMENT

U.S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

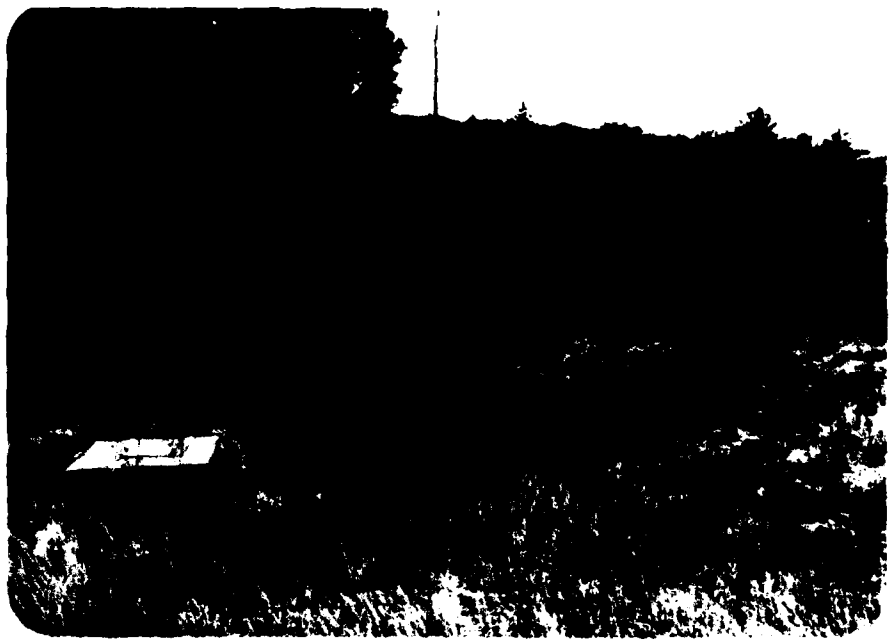


PHOTO NO. 3

UPSTREAM SLOPE OF DAM
LOOKING AT THE LEFT ABUTMENT.

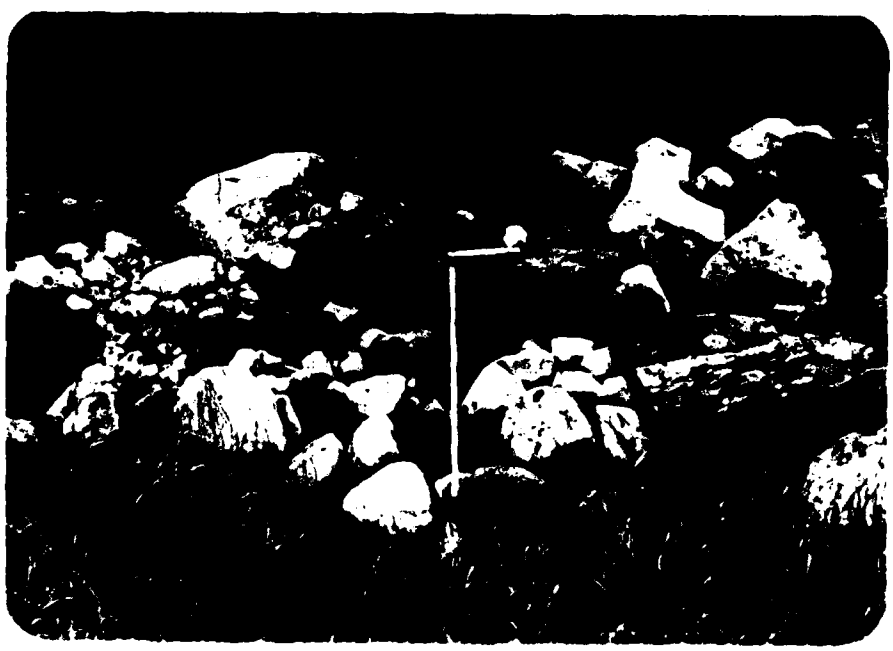


PHOTO NO. 4

RIPRAP ALONG DOWNSTREAM TOE OF DAM.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		



PHOTO NO. 5

PRINCIPAL SPILLWAY OUTLET CONDUIT AND PLUNGE POOL. NOTE EROSION ON BANK AND TWO 12-INCH CMP TOE DRAINS ALONG SIDE THE OUTLET.



PHOTO NO. 6

DOWNSTREAM SLOPE OF DIKE. NOTE RIPRAP AT TOE AND DRAIN OUTLET PIPE.

U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		



PHOTO NO. 7

UPSTREAM SLOPE OF DIKE
LOOKING TOWARD THE LEFT ABUTMENT.



PHOTO NO. 8

12-INCH FOUNDATION DRAIN OUTLET AT TOE OF DIKE.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

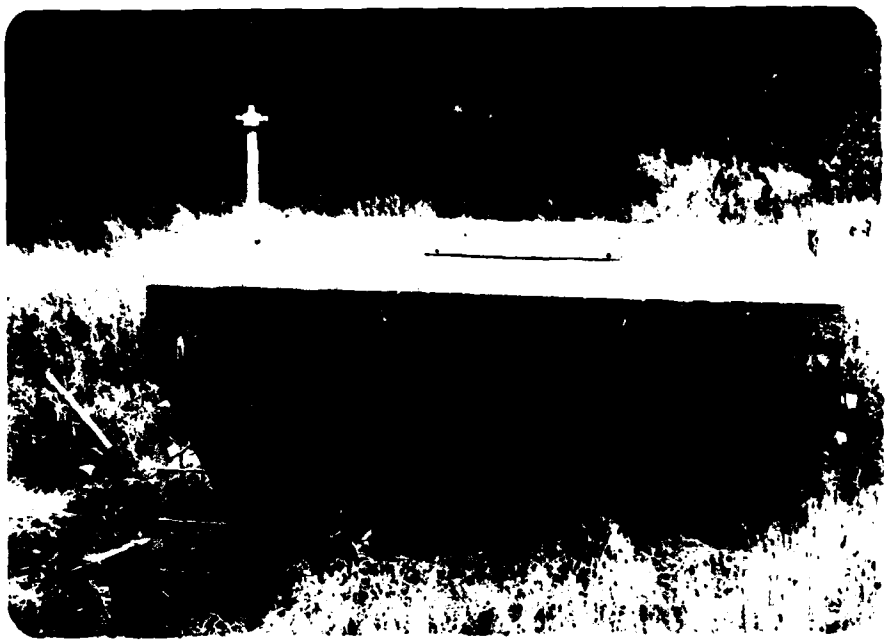


PHOTO NO. 9

PRINCIPAL SPILLWAY INTAKE STRUCTURE.

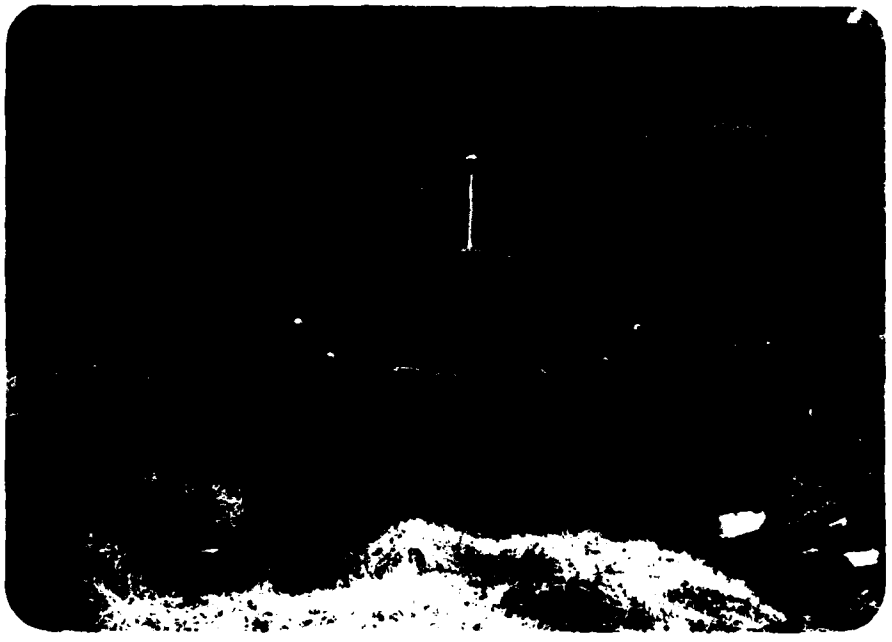


PHOTO NO. 10

PRINCIPAL SPILLWAY INTAKE STRUCTURE WITH
15-INCH SLUICE GATE AND TRASH RACK.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		



PHOTO NO. 11

EMERGENCY SPILLWAY CHANNEL FROM DOWNSTREAM.



PHOTO NO. 12

EMERGENCY SPILLWAY CHANNEL. NOTE
POOR VEGETATIVE COVER AND DIKE IN REAR.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		



PHOTO NO. 13

LEFT SIDE SLOPE OF EMERGENCY SPILLWAY.
NOTE MOSS AND POOR VEGETATIVE COVER.



PHOTO NO. 14*

STREAM CHANNEL AND DOWNSTREAM END
OF PLUNGE POOL. NOTE OVERHANGING TREES.

11 FEBRUARY '81

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		



PHOTO NO. 15

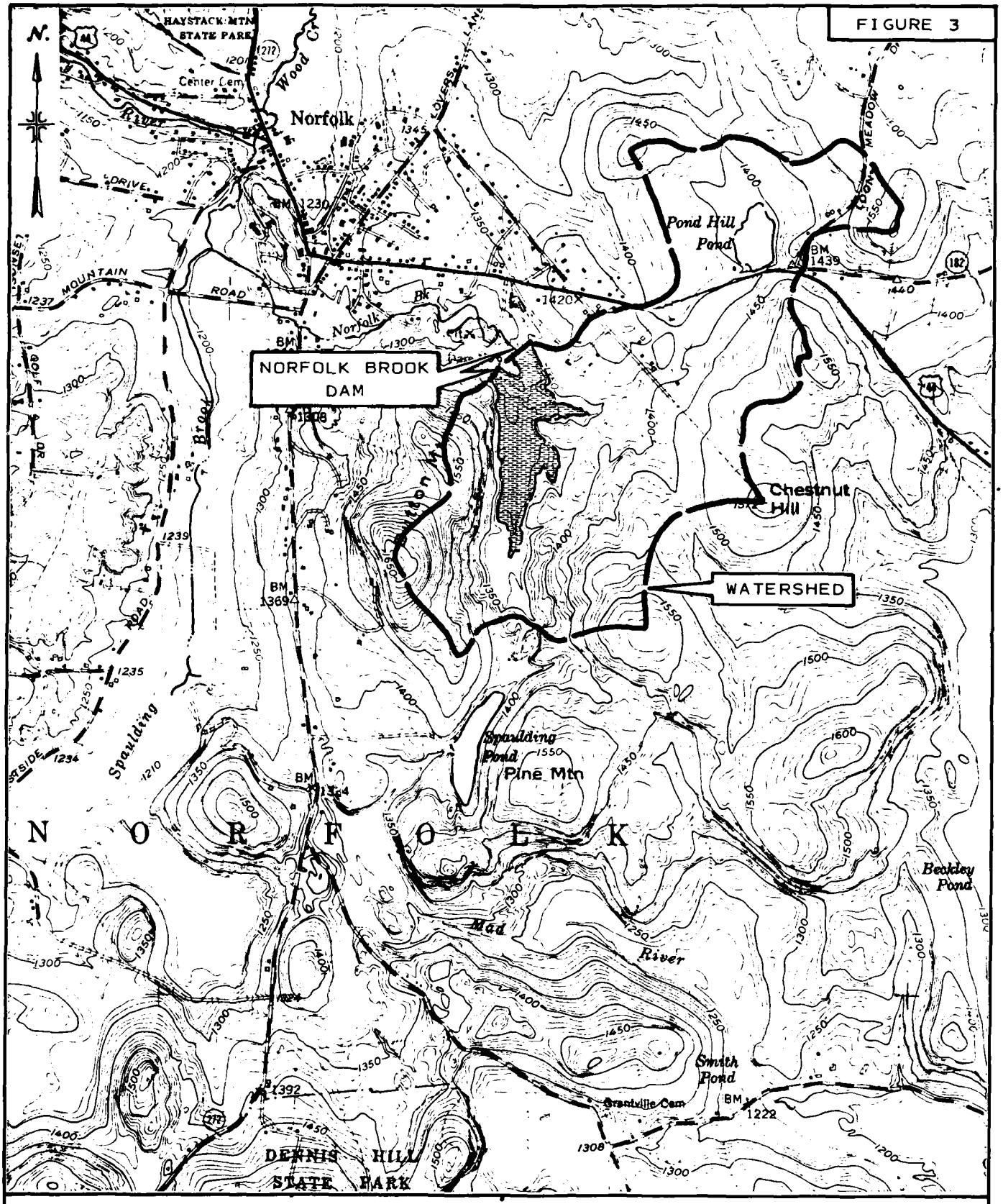
DISCHARGE CHANNEL FOR PRINCIPAL SPILLWAY;
FLOW ENTERS FROM RIGHT SIDE OF PHOTO. ROAD AT RIGHT OF
PHOTO PROVIDES VEHICLE ACCESS TO THE DAM.
ROAD WOULD BE OVERTOPPED DURING HIGH FLOWS.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	NORFOLK BROOK DAM NORFOLK BROOK NORFOLK, CONNECTICUT CT 00485 17 NOVEMBER '80
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

FIGURE 3



WATERSHED MAP

NORFOLK BROOK DAM
NORFOLK, CONNECTICUT

ROALD HAESTAD, INC. SCALE: 1" = 2000' NORFOLK QUADRANGLE 1969

Blockbury #6
CN-408H

SHEET 5
1 of 24

2) Pipe Flow

$Q = CA\sqrt{2gh}$

$Q = 0.504(4.91)(8.02)^{1/2}$

$Q = 17.82\ h^{1/2}$

$C = \frac{1}{\sqrt{K_c + K_m + K_{ul} + K_{ex}}}$

$C = \frac{1}{\sqrt{1+1.25+(0.00756)(216)}}$

$C = \frac{1}{\sqrt{3.94}}$ $\therefore C = 0.504$

Q Outlet Control at 96.25

Elev.	h	$h^{1/2}$	Q = 17.82
1300.0	3.75	1.94	35.4
02.0	5.75		
04.0	7.75	2.79	55.3
05.0	8.75	2.96	58.7
06.0	9.75		
10.0	13.75	3.72	73.7
15.0	18.75		
20.0	23.75	4.88	96.7
25.0			
30.0	33.75	5.32	115.2
33.0	36.75	6.06	120.1
34.8	38.55	6.21	123.1
35.7	39.45	6.28	124.5
36.4	40.15	6.34	125.7
37.0	40.75	6.38	126.5
37.1	41.85	6.47	128.2
39.1	42.85	6.55	129.8

Elev.	H	$H^{3/2}$	Q = 51.0 $H^{3/2}$
1304	0	0	0
1304.5	0.5	0.355	18.1
1305	1.0	1.0	51.0
1305.5	1.5	1.83	93.2

Weir Flow

$Q = KLH^{3/2}$

$Q = (3.4)(15)(H^{3/2}) = 51.0H^{3/2}$

$L = 15 + 2 \times 7.5$

By: S.C.S.

SPILLWAY DISCHARGE DATA

$b = 80'$ $z = 3:1$ $n = 0.04$ $L = 82'$

EMERGENCY SPILLWAY CREST ELEVATION = 1333.0

q c.f.s/ft.	Hp ft.	d_c ft.	$z d_c$	$W = b + z d_c$ ft.	$Q_{em} = q \times W$ c.f.s.	Q_p c.f.s	$Q_t = Q_{em} + Q_p$ c.f.s	WATER SURFACE ELEVATION ft.	ES-98 V_c ft/sec.	ES-98 S_c Ft/Ft.
0	—	—	—	—	—	120.1	120.1	1333.0	—	—
5	1.84	.92	2.76	80.76	403.8	123.1	526.9	1334.8	5.4	.0241
10	2.70	1.46	4.38	84.38	843.8	124.5	968.3	1335.7	6.8	.0207
15	3.41	1.92	5.76	85.76	1286.4	125.7	1412.1	1336.4	7.8	.0189
20	4.03	2.32	6.96	86.96	1739.2	126.5	1865.7	1337.0	8.6	.0177
30	5.11	3.05	9.15	89.15	2674.5	128.2	2802.7	1338.1	9.9	.0162
40	6.09	3.69	11.07	91.07	3642.8	129.8	3772.6	1339.1	10.9	.0151

MAX OUTFLOW THRU EM. SPILLWAY 305.0 C.F.S.
MAX VELOCITY THRU EM. SPILLWAY = 5.4 FT./SEC.
25% x 305 C.F.S. = 76.2 C.F.S:
CRITICAL SLOPE S_c FOR 76.2 C.F.S = 0.0241

BLACKBERRY RIVER No.6
CH. 408H

B.J.G. 2/[illegible]/96
SHEET 6
2 of 24

By: S.C.S.

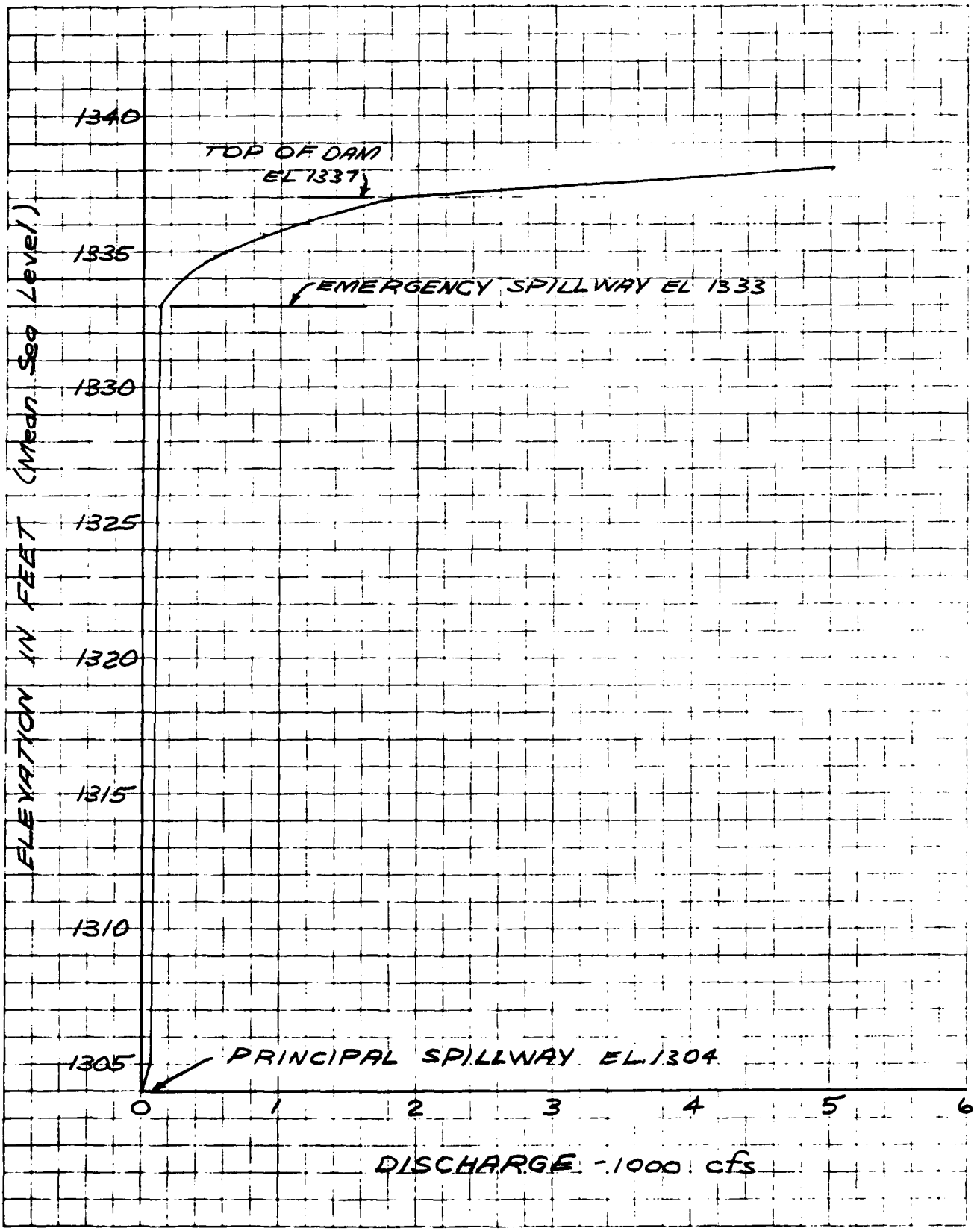
D-3

BY SAL DATE 1-8-81 **ROALD HAESTAD, INC.** SHEET NO 3 OF 24

CONSULTING ENGINEERS

CKD BY DLS DATE 1/27/81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-036

SUBJECT NORFOLK BROOK DAM - Project discharge capacity



O.K.

CONNECTICUT — BLACKBERRY RIVER WATERSHED — SB-4

11/17/59 WTF 11/17/59 SIZE "C"

4

STAGE STORAGE COMPUTATIONS

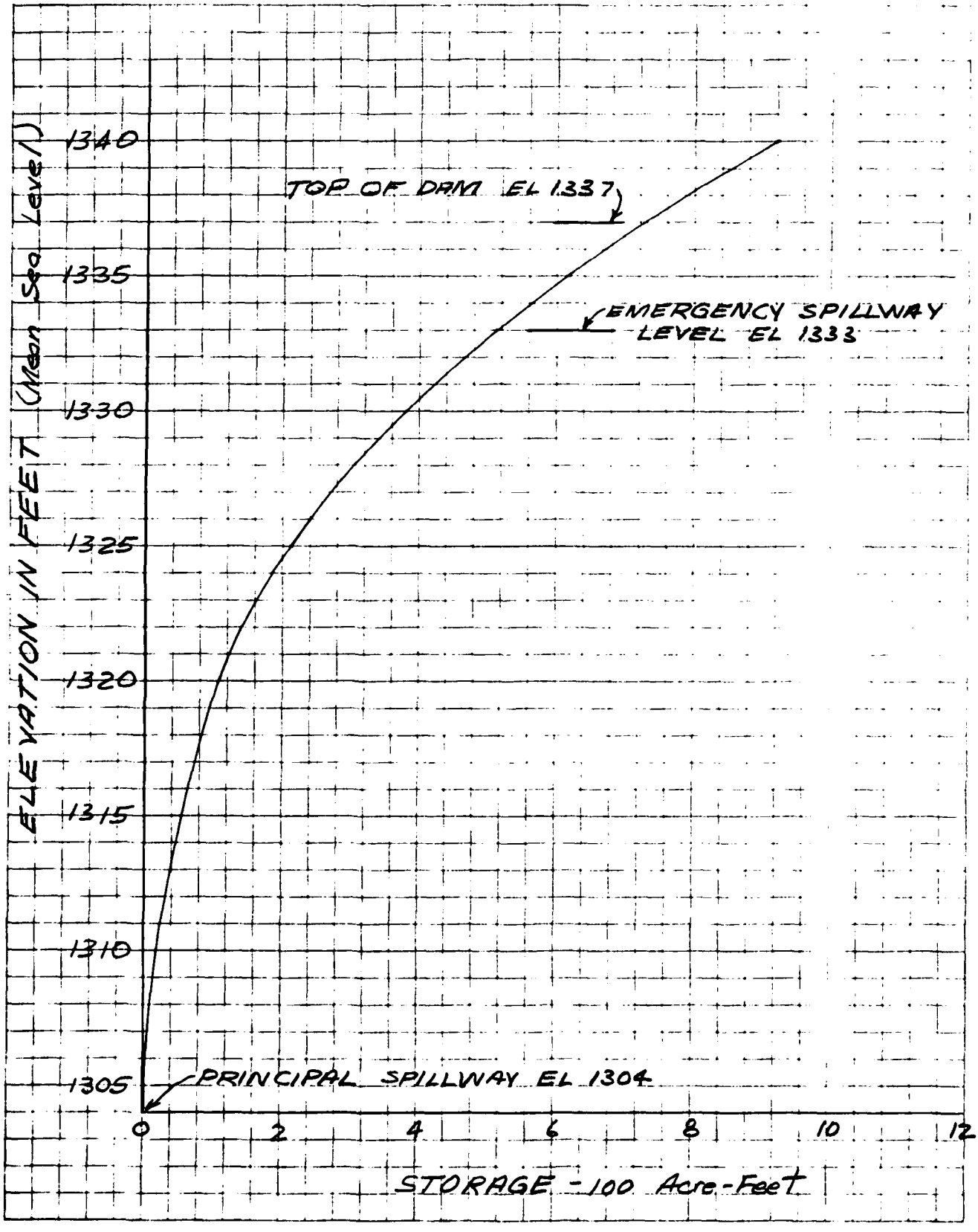
ELEV.	AREA ACRES	Σ ACRES	AVE. ACRES	DEPTH FT.	VOL. ACRE FT.	Σ VOL. ACRE FT.	ADJ'D STORAGE
1300	0					0	
		1.20	.60	3	1.80		
1303	1.20					1.80	AT ELEV. 1304 STOR. = 0
		3.20	1.60	2	3.20	5.00	3.6
1305	2.0						
		6.71	3.36	5	16.80	21.80	18.4
1310	4.71						
		12.93	6.47	5	32.35	54.15	50.8
1315	8.22						
		22.28	11.14	5	55.70	109.85	106.5
1320	14.06						
		41.86	20.93	5	104.65	214.50	211.1
1325	27.80						
		67.31	33.66	5	168.30	382.80	379.4
1330	39.51						
		88.86	44.43	3	133.29	516.09	512.7
1333	49.35						
		105.32	52.66	2	105.32	621.41	618.0
1333	56.97						
		121.08	60.54	5	302.70	924.11	920.7
1340	64.11						

By: S.C.S.

BY SAL DATE 1-8-81 **ROALD HAESTAD, INC.** SHEET NO 5 OF 24

CKD BY DLS DATE 1/27/81 CONSULTING ENGINEERS 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-036

SUBJECT NORFOLK BROOK DAM - Surcharge storage capacity curve



TEST FLOOD = PMF

Drainage Area = 631 Acres = 0.99 use 1.0 sq mile

From Corps of Eng chart for "Mountainous" Terrain

MPF = 2,600 cfs/sq mi (2.0 sq mi Minimum)

PMF = 2,600 cfs/sq mi × 1.0 sq mi = 2,600 cfs

H_1 = 33.3 feet above principal spillway, from discharge curve

$STOR_1$ = 745 Acre-Feet, from Surcharge Storage capacity curve
= 14" of runoff from 1 sq mi

$Q_{P2} = Q_{P1}(1 - STOR_1/19) = 2,600 \text{ cfs}(1 - 14/19) = 684 \text{ cfs}$

H_2 = 31.2 feet $STOR_2$ = 625 Acre-Feet

$STOR_{AVE} = (STOR_1 + STOR_2/2) = (745 + 625/2) = 685$ Ac. Ft
= 12.8" runoff

$Q_{P3} = Q_{P1}(1 - STOR_{AVE}/19) = 2,600 \text{ cfs}(1 - 12.8/19) = 848$ cfs
use 850 cfs

H_3 = 31.5 feet, EL 1335.6

Project discharge capacity = 1,865 cfs (From discharge capacity curve)
(At Top of dam)

% of Test Flood = (1865/850) × 100 = 219% of PMF

From Design Report:

For 18.8" of Runoff the Peak Outflow = 1,412 cfs @ EL 1336.4

% of Test Flood = (1865/1412) × 100 = 132% of 18.8" of Runoff

Note: As the Design Report Computations are more precise, those figures will be used.

S = Storage at time of failure with water level at PMF Elev.

s = Surcharge Storage Capacity

S = 650 Acre-Feet (Surcharge storage capacity curve)

Q_{pl} = Peak Failure Outflow = $8/27\ W_b \sqrt{g}\ Y_o^{3/2}$

W_b = Breach Width - 40% of dam length across river at mid height = 0.4(220) = 88

Y_o = Total height from river bed to pool level at time of failure = 42

$Q_{pl} = 8/27\ (88)\sqrt{32.2}\ (42)^{3/2}$

= 40,272 use 40,300 cfs

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 1

RAILROAD EMBANK.
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.22	0.1
2.0	0.45	0.4
3.0	0.67	1.0
4.0	0.89	1.8
5.0	1.12	2.8
6.0	1.34	4.0
7.0	1.56	5.5
8.0	1.78	7.1
9.0	2.01	9.0
10.0	2.23	11.2
11.0	3.27	13.9
12.0	4.30	17.7
13.0	5.34	22.5
14.0	6.38	28.4
15.0	7.41	35.3
16.0	8.45	43.2
17.0	9.49	52.2
18.0	10.53	62.2
19.0	11.56	73.2
20.0	12.60	85.3
21.0	13.47	98.3
22.0	14.34	112.2
23.0	15.21	127.0
24.0	16.08	142.7
25.0	16.95	159.2
26.0	17.82	176.6
27.0	18.69	194.8
28.0	19.56	213.9

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 1

RAILROAD EMBANK.

HEIGHT ABOVE INVERT (FEET)	DISCHARGE CAPACITY CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	41	0	41
2.0	83	0	83
3.0	125	0	125
4.0	166	0	166
5.0	245	0	245
6.0	324	0	324
7.0	403	0	403
8.0	481	0	481
9.0	573	0	573
10.0	664	0	664
11.0	751	125	876
12.0	838	354	1192
13.0	925	650	1575
14.0	1013	1000	2013
15.0	1071	1398	2468
16.0	1129	1837	2966
17.0	1187	2315	3502
18.0	1245	2828	4073
19.0	1311	3500	4811
20.0	1378	4306	5684
21.0	1436	5210	6646
22.0	1494	6196	7690
23.0	1536	8807	10342
24.0	1577	13194	14771
25.0	1627	18833	20460
26.0	1677	25437	27113
27.0	1718	32866	34584
28.0	1760	41031	42790

STORAGE AT TIME OF FAILURE=S= 650 AC. FT.
LENGTH OF REACH=L= 3750 FT

INFLOW INTO REACH=QP1= 40300 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 27.7 FT.
STORAGE IN REACH=V1= 208.1 AC. FT.

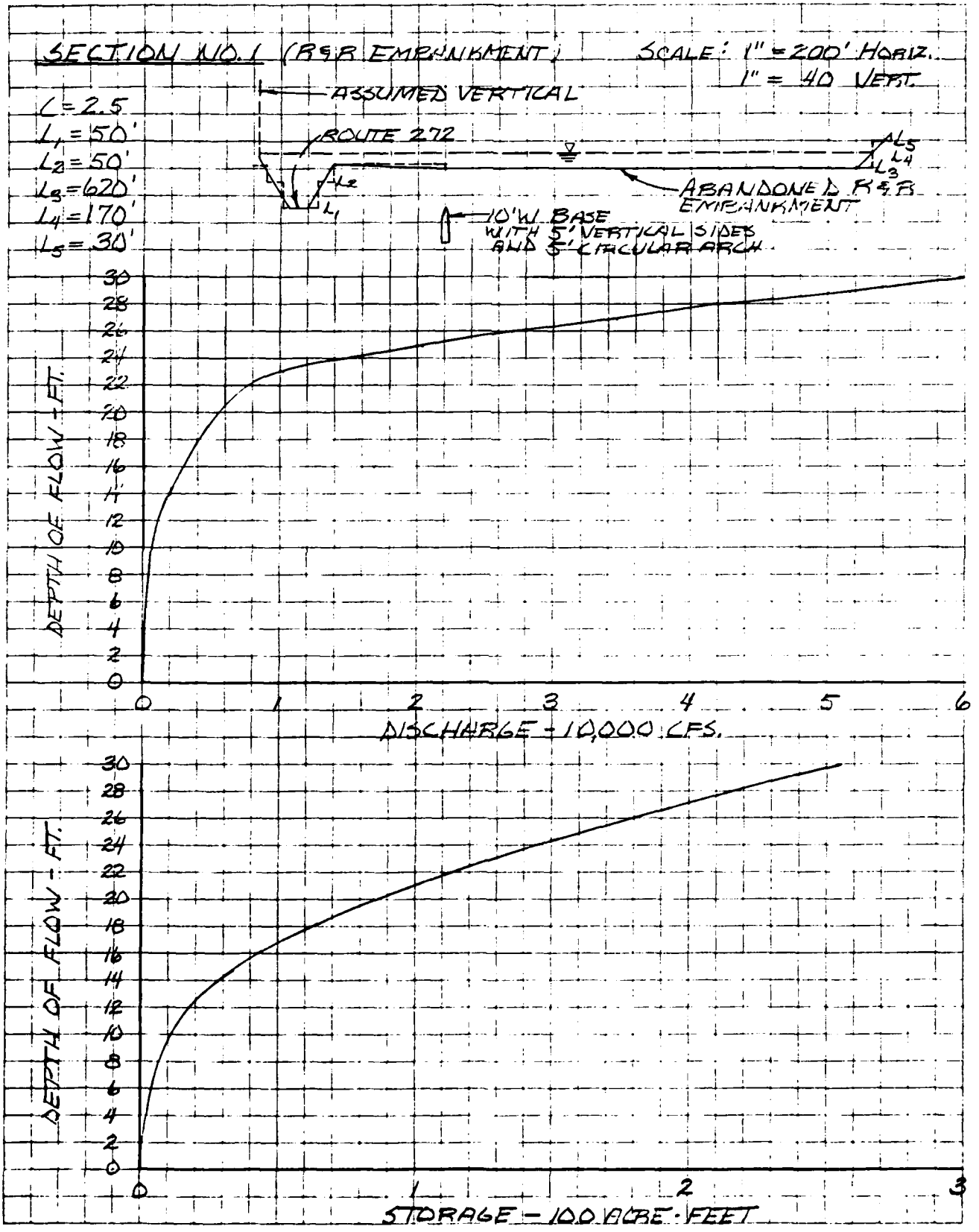
TRIAL REACH OUTFLOW=QP(TRIAL)= 27396 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 26.0 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 177.2 AC. FT.

REACH OUTFLOW=QP2= 28353 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 26.2 FT.

BY LBG DATE 1-12-81 **ROALD HAESTAD, INC.** SHEET NO 10 OF 24

CKD BY SAL DATE 1-16-81 CONSULTING ENGINEERS 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-036

SUBJECT NORFOLK BROOK DAM - FLOOD ROUTING



SECTION NUMBER 2

SPAULDING B. POND
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	8.24	4.8
2.0	15.18	16.5
3.0	22.12	35.1
4.0	29.06	60.7
5.0	36.00	93.2
6.0	44.90	133.7
7.0	53.80	183.0
8.0	62.70	241.3
9.0	71.60	308.4
10.0	80.50	384.5
11.0	89.40	469.4
12.0	98.30	563.3
13.0	107.20	666.0
14.0	116.10	777.7
15.0	125.00	898.2
16.0	131.80	1026.6
17.0	138.60	1161.8

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SECTION NUMBER 2

SPAULDING B. POND

HEIGHT ABOVE SPILLWAY LEVEL (FEET)	SPILLWAY DISCHARGE CAPACITY (CFS)
1.0	195
2.0	552
3.0	1113
4.0	1964
5.0	3118
6.0	4509
7.0	6121
8.0	7925
9.0	9922
10.0	12092
11.0	14443
12.0	16957
13.0	19646
14.0	22493
15.0	25485
16.0	28613
17.0	31870

STORAGE AT TIME OF FAILURE=S= 650 AC. FT.
LENGTH OF REACH=L= 4500 FT

INFLOW INTO REACH=QP1= 28353 CFS

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 2

SPAULDING B. POND

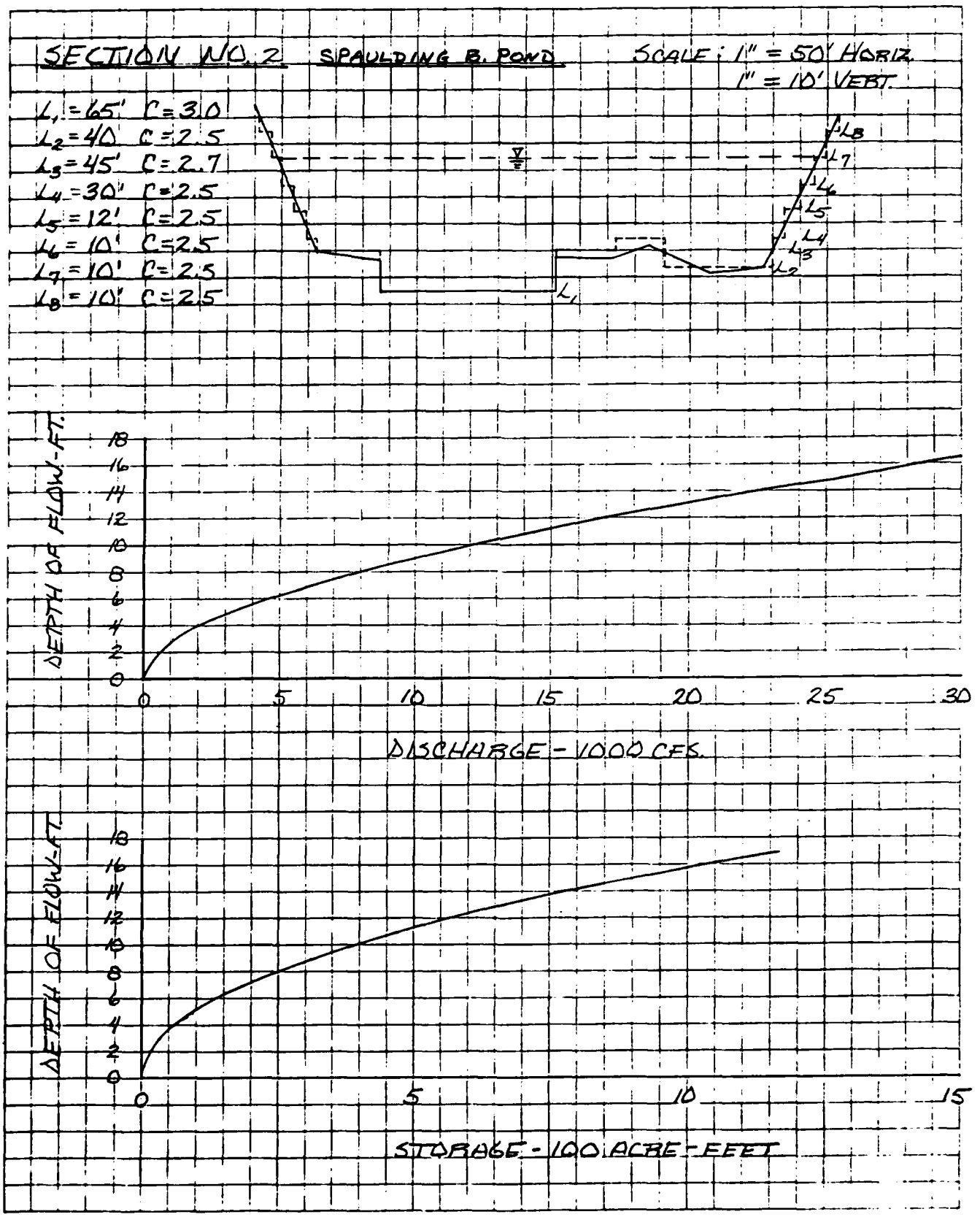
TIME (MIN.)	AVERAGE INFLOW FOR, ΔT (AC-FT)	TRIAL DEPTH OF FLOW (FEET)	AVERAGE OUTFLOW FOR, ΔT (AC-FT)	INCREMENTAL STORAGE, ΔS (AC-FT)	TOTAL STORAGE (AC-FT)	DEPTH OF FLOW END OF, ΔT (FEET)
1.0	38.5	3.1	0.8	37.6	37.6	3.1
2.0	37.3	4.4	2.5	34.8	72.5	4.4
3.0	36.1	5.3	4.1	32.0	104.5	5.3
4.0	34.9	6.0	5.5	29.4	133.9	6.0
5.0	33.7	6.5	6.8	26.9	160.8	6.5
6.0	32.5	7.0	8.0	24.6	185.4	7.0
7.0	31.4	7.4	9.0	22.4	207.7	7.4
8.0	30.2	7.8	9.9	20.3	228.0	7.8
9.0	29.0	8.1	10.7	18.3	246.2	8.1
10.0	27.8	8.3	11.5	16.4	262.6	8.3
11.0	26.6	8.5	12.1	14.5	277.1	8.5
12.0	25.4	8.7	12.6	12.8	289.9	8.7
13.0	24.3	8.9	13.1	11.1	301.1	8.9
14.0	23.1	9.0	13.6	9.5	310.6	9.0
15.0	21.9	9.1	13.9	8.0	318.6	9.1
16.0	20.7	9.2	14.2	6.5	325.1	9.2
17.0	19.5	9.3	14.4	5.1	330.2	9.3
18.0	18.3	9.3	14.6	3.7	333.9	9.3
19.0	17.2	9.4	14.7	2.4	336.4	9.4
20.0	16.0	9.4	14.8	1.2	337.6	9.4
21.0	14.8	9.4	14.8	-0.0	337.5	9.4
22.0	13.6	9.4	14.8	-1.2	336.4	9.4
23.0	12.4	9.3	14.7	-2.3	334.1	9.3
24.0	11.2	9.3	14.6	-3.4	330.7	9.3
25.0	10.1	9.2	14.5	-4.4	326.3	9.2
26.0	8.9	9.2	14.3	-5.4	320.9	9.2
27.0	7.7	9.1	14.0	-6.3	314.6	9.1
28.0	6.5	9.0	13.8	-7.3	307.3	9.0
29.0	5.3	8.9	13.5	-8.1	299.2	8.9
30.0	4.1	8.7	13.1	-9.0	290.2	8.7
31.0	3.0	8.6	12.7	-9.8	280.5	8.6
32.0	1.8	8.4	12.3	-10.5	269.9	8.4
33.0	0.6	8.3	11.9	-11.3	258.7	8.3

REACH OUTFLOW=QP2= 10753 CFS
HEIGHT ABOVE SPILLWAY LEVEL=H2= 9.4 FT.

SUBJECT ..NORFOLK BROOK DAM - FLOOD ROUTING.....

SECTION NO. 2 SPAULDING B. POND SCALE: 1" = 50' HORIZ. 1" = 10' VERT.

$L_1 = 65'$ $C = 3.0$
$L_2 = 40$ $C = 2.5$
$L_3 = 45'$ $C = 2.7$
$L_4 = 30'$ $C = 2.5$
$L_5 = 12'$ $C = 2.5$
$L_6 = 10'$ $C = 2.5$
$L_7 = 10'$ $C = 2.5$
$L_8 = 10'$ $C = 2.5$



SECTION NUMBER 3A

MAIN CHANNEL

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	26	13	0.50	0.0375	4.52	59
2.0	34	43	1.26	0.0375	8.40	358
3.0	41	79	1.92	0.0375	11.10	883
4.0	49	124	2.51	0.0375	13.30	1645
5.0	57	175	3.08	0.0375	15.22	2664
6.0	63	233	3.70	0.0375	17.22	4012
7.0	69	297	4.30	0.0375	19.03	5653
8.0	75	367	4.89	0.0375	20.72	7604
9.0	81	443	5.46	0.0375	22.30	9879
10.0	87	525	6.02	0.0375	23.80	12494
11.0	92	613	6.63	0.0375	25.39	15554
12.0	97	705	7.23	0.0375	26.91	18971
13.0	97	800	8.21	0.0375	29.28	23421
14.0	97	895	9.18	0.0375	31.55	28237
15.0	97	990	10.16	0.0375	33.74	33408
16.0	97	1085	11.13	0.0375	35.87	38920
17.0	97	1180	12.11	0.0375	37.93	44764
18.0	97	1275	13.08	0.0375	39.94	50930
19.0	97	1370	14.06	0.0375	41.90	57411
20.0	97	1465	15.03	0.0375	43.82	64199

MANNING COEFFICIENT=N=0.0400

SECTION NUMBER 3B

LEFT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
13.0	30	15	0.50	0.0375	2.27	34
14.0	39	49	1.28	0.0375	4.23	208
15.0	47	92	1.95	0.0375	5.61	517
16.0	56	144	2.57	0.0375	6.75	969
17.0	65	204	3.15	0.0375	7.74	1575
18.0	73	272	3.72	0.0375	8.64	2350
19.0	82	349	4.27	0.0375	9.47	3307
20.0	90	435	4.81	0.0375	10.25	4459

MANNING COEFFICIENT=N=0.0800

SECTION NUMBER 3C

RIGHT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
6.0	37	19	0.50	0.0375	1.81	34
7.0	74	74	1.00	0.0375	2.88	213
8.0	111	167	1.50	0.0375	3.77	628
9.0	148	296	2.00	0.0375	4.57	1352
10.0	185	463	2.50	0.0375	5.30	2451
11.0	188	649	3.46	0.0375	6.58	4267
12.0	190	838	4.40	0.0375	7.72	6469
13.0	193	1029	5.33	0.0375	8.78	9029
14.0	196	1223	6.24	0.0375	9.76	11927
15.0	199	1419	7.15	0.0375	10.68	15147
16.0	201	1618	8.04	0.0375	11.55	18678
17.0	204	1819	8.92	0.0375	12.38	22509
18.0	207	2023	9.79	0.0375	13.17	26633
19.0	209	2229	10.65	0.0375	13.93	31043
20.0	212	2438	11.50	0.0375	14.66	35733

MANNING COEFFICIENT=N=0.1000

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 3

TOTAL SECTION

	AREA (SQ.FT.)				DISCHARGE (CFS)			
H	A	B	C	TOTAL	A	B	C	TOTAL
1.0	13	0	0	13	59	0	0	59
2.0	43	0	0	43	358	0	0	358
3.0	79	0	0	79	883	0	0	883
4.0	124	0	0	124	1645	0	0	1645
5.0	175	0	0	175	2664	0	0	2664
6.0	233	0	19	252	4012	0	34	4045
7.0	297	0	74	371	5653	0	213	5866
8.0	367	0	167	534	7604	0	628	8232
9.0	443	0	296	739	9879	0	1352	11231
10.0	525	0	463	988	12494	0	2451	14945
11.0	613	0	649	1261	15554	0	4267	19821
12.0	705	0	838	1543	18971	0	6469	25440
13.0	800	15	1029	1844	23421	34	9029	32484
14.0	895	49	1223	2167	28237	208	11927	40373
15.0	990	92	1419	2501	33408	517	15147	49072
16.0	1085	144	1618	2846	38920	969	18678	58566
17.0	1180	204	1819	3202	44764	1575	22509	68848
18.0	1275	272	2023	3570	50930	2350	26633	79914
19.0	1370	349	2229	3948	57411	3307	31043	91761
20.0	1465	435	2438	4338	64199	4459	35733	104391

STORAGE AT TIME OF FAILURE=S= 650 AC. FT.
LENGTH OF REACH=L= 4000 FT

INFLOW INTO REACH=QP1= 10753 CFS
DEPTH OF FLOW=H1= 8.8 FT.
CROSS SECTIONAL AREA=A1= 706 SQ.FT.
STORAGE IN REACH=V1= 64.9 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 9680 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 8.5 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 633 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 58.1 AC. FT.

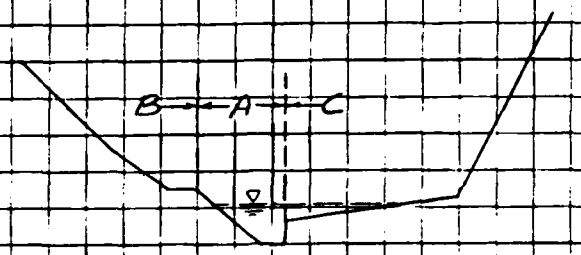
REACH OUTFLOW=QP2= 9736 CFS
DEPTH OF FLOW=H2= 8.5 FT.

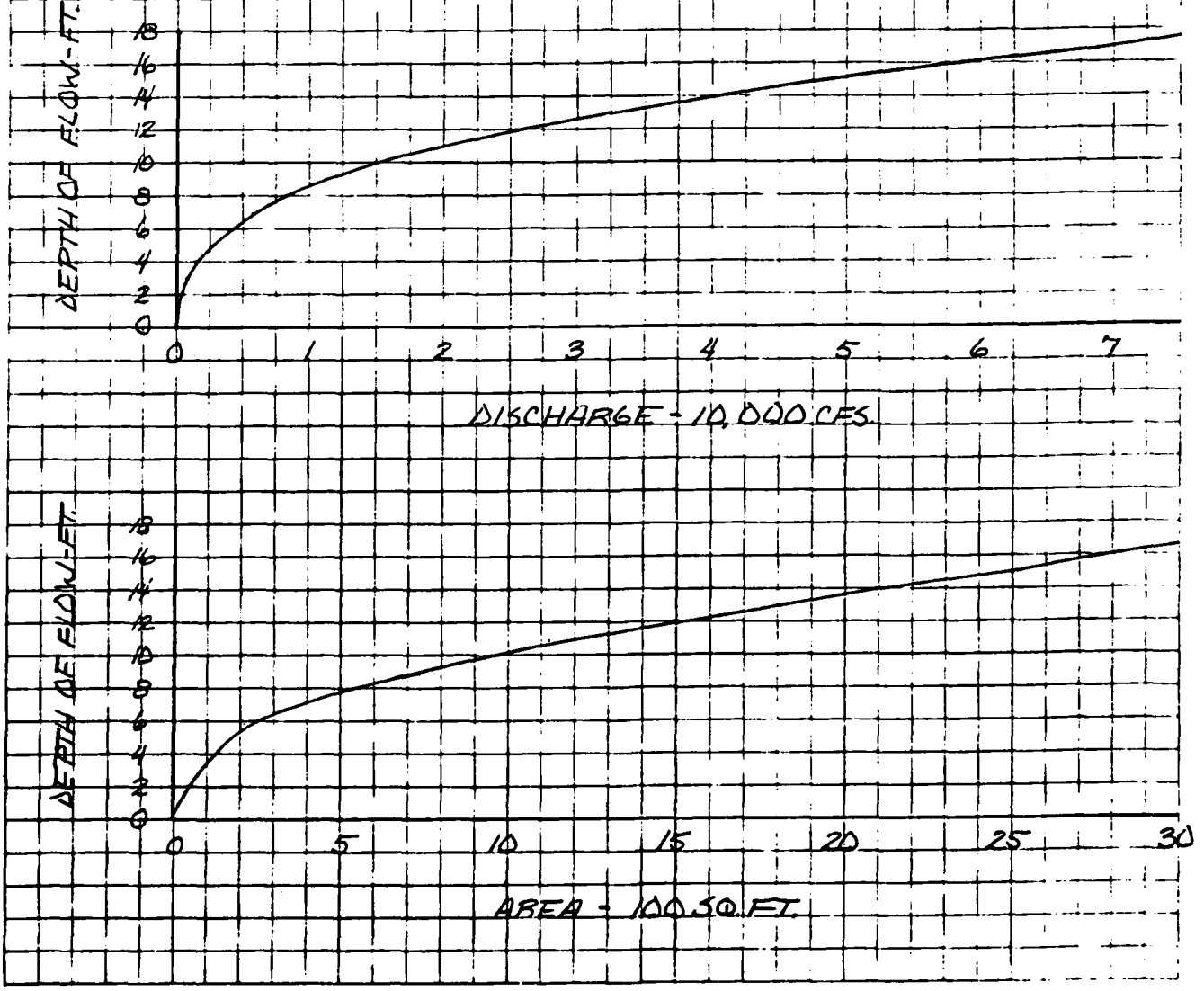
SUBJECT NOREALL BROOK DAM - FLOOD ROUTING

SECTION NO. 3

L = 4000'
N(A) = 0.04
(B) = 0.08
(C) = 0.1
S = 0.0375

SCALE: 1" = 200' HORIZ.
1" = 40' VERT.





BY SAL DATE 1/16/81 ROALD HAESTAD, INC. SHEET NO 20 OF 24

CKD BY DLS DATE 2/13/81 CONSULTING ENGINEERS JOB NO. 049 036

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 4A

MAIN CHANNEL

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
1.0	22	11	0.50	0.0250	4.22	46
2.0	34	39	1.14	0.0250	7.32	284
3.0	46	78	1.70	0.0250	9.56	749
4.0	48	125	2.59	0.0250	12.67	1577
5.0	48	172	3.57	0.0250	15.68	2690
6.0	48	219	4.55	0.0250	18.43	4028
7.0	48	266	5.53	0.0250	20.99	5573
8.0	48	313	6.51	0.0250	23.40	7312
9.0	48	360	7.49	0.0250	25.69	9236
10.0	48	407	8.47	0.0250	27.88	11335
11.0	48	454	9.44	0.0250	29.99	13602
12.0	48	501	10.42	0.0250	32.03	16032
13.0	48	548	11.40	0.0250	34.01	18619
14.0	48	595	12.38	0.0250	35.93	21359
15.0	48	642	13.36	0.0250	37.80	24247
16.0	48	689	14.34	0.0250	39.62	27280
17.0	48	736	15.32	0.0250	41.40	30454
18.0	48	783	16.30	0.0250	43.15	33767
19.0	48	830	17.27	0.0250	44.86	37214
20.0	48	877	18.25	0.0250	46.54	40795

MANNING COEFFICIENT=N=0.0350

BY SAL DATE 1/16/81 ROALD HAESTAD, INC. SHEET NO 21 OF 24

CKD BY DLS DATE 2/13/81 CONSULTING ENGINEERS JOB NO. 049 036

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 4B

LEFT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
4.0	33	16	0.50	0.0250	2.11	35
5.0	66	66	1.00	0.0250	3.36	221
6.0	99	148	1.50	0.0250	4.40	650
7.0	131	263	2.00	0.0250	5.33	1400
8.0	164	411	2.50	0.0250	6.18	2539
9.0	197	591	3.00	0.0250	6.98	4128
10.0	230	805	3.50	0.0250	7.74	6227
11.0	248	1044	4.20	0.0250	8.74	9127
12.0	267	1302	4.88	0.0250	9.65	12567
13.0	285	1578	5.53	0.0250	10.50	16561
14.0	315	1878	5.96	0.0250	11.03	20708
15.0	334	2202	6.59	0.0250	11.79	25968
16.0	354	2546	7.20	0.0250	12.52	31862
17.0	373	2909	7.80	0.0250	13.20	38409
18.0	392	3291	8.40	0.0250	13.87	45628
19.0	411	3692	8.98	0.0250	14.50	53539
20.0	430	4113	9.56	0.0250	15.12	62161

MANNING COEFFICIENT=N=0.0700

SECTION NUMBER 4C

RIGHT OVERBANK

H (FT)	W (FT)	A (SQ-FT)	R (FT)	S (FT/FT)	V (FT/SEC)	Q (CFS)
5.0	8	4	0.50	0.0250	1.47	6
6.0	15	15	0.99	0.0250	2.34	35
7.0	23	34	1.49	0.0250	3.06	103
8.0	30	60	1.98	0.0250	3.71	222
9.0	38	94	2.48	0.0250	4.30	403
10.0	45	135	2.97	0.0250	4.86	656
11.0	48	181	3.75	0.0250	5.67	1029
12.0	51	231	4.50	0.0250	6.40	1476
13.0	54	282	5.21	0.0250	7.06	1995
14.0	57	337	5.90	0.0250	7.67	2586
15.0	60	394	6.57	0.0250	8.24	3251
16.0	63	455	7.22	0.0250	8.78	3989
17.0	66	517	7.85	0.0250	9.28	4803
18.0	69	583	8.47	0.0250	9.77	5693
19.0	72	651	9.08	0.0250	10.23	6662
20.0	75	723	9.68	0.0250	10.67	7709

MANNING COEFFICIENT=N=0.1000

SUBJECT NORFOLK BROOK DAM-FLOOD ROUTING AT PMF ELEVATION

SECTION NUMBER 4

TOTAL SECTION

	AREA (SQ.FT.)				DISCHARGE (CFS)			
H	A	B	C	TOTAL	A	B	C	TOTAL
1.0	11	0	0	11	46	0	0	46
2.0	39	0	0	39	284	0	0	284
3.0	78	0	0	78	749	0	0	749
4.0	125	16	0	141	1577	35	0	1612
5.0	172	66	4	241	2690	221	6	2916
6.0	219	148	15	381	4028	650	35	4713
7.0	266	263	34	562	5573	1400	103	7076
8.0	313	411	60	783	7312	2539	222	10073
9.0	360	591	94	1045	9236	4128	403	13767
10.0	407	805	135	1347	11335	6227	656	18218
11.0	454	1044	181	1679	13602	9127	1029	23759
12.0	501	1302	231	2033	16032	12567	1476	30075
13.0	548	1578	282	2407	18619	16561	1995	37175
14.0	595	1878	337	2809	21359	20708	2586	44653
15.0	642	2202	394	3238	24247	25968	3251	53466
16.0	689	2546	455	3689	27280	31862	3989	63132
17.0	736	2909	517	4162	30454	38409	4803	73667
18.0	783	3291	583	4656	33767	45628	5693	85088
19.0	830	3692	651	5173	37214	53539	6662	97415
20.0	877	4113	723	5712	40795	62161	7709	110666

STORAGE AT TIME OF FAILURE=S= 650 AC. FT.
LENGTH OF REACH=L= 4000 FT

INFLOW INTO REACH=QP1= 9736 CFS
DEPTH OF FLOW=H1= 7.9 FT.
CROSS SECTIONAL AREA=A1= 758 SQ.FT.
STORAGE IN REACH=V1= 69.6 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 8693 CFS
TRIAL DEPTH OF FLOW=H(TRIAL)= 7.5 FT.
TRIAL CROSS SECTIONAL AREA=A(TRIAL)= 681 SQ.FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 62.6 AC. FT.

REACH OUTFLOW=QP2= 8746 CFS
DEPTH OF FLOW=H2= 7.6 FT.

BY LEG DATE 1-12-81 **ROALD HAESTAD, INC.** SHEET NO 24 OF 24

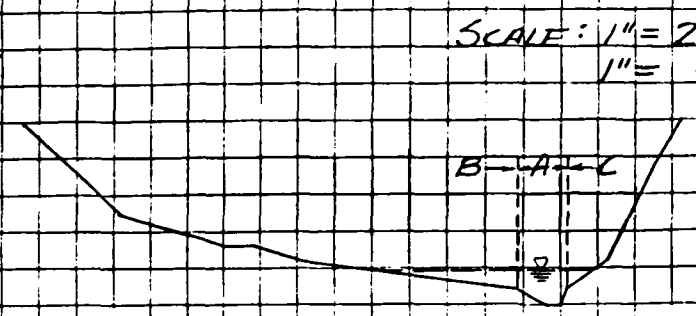
CONSULTING ENGINEERS

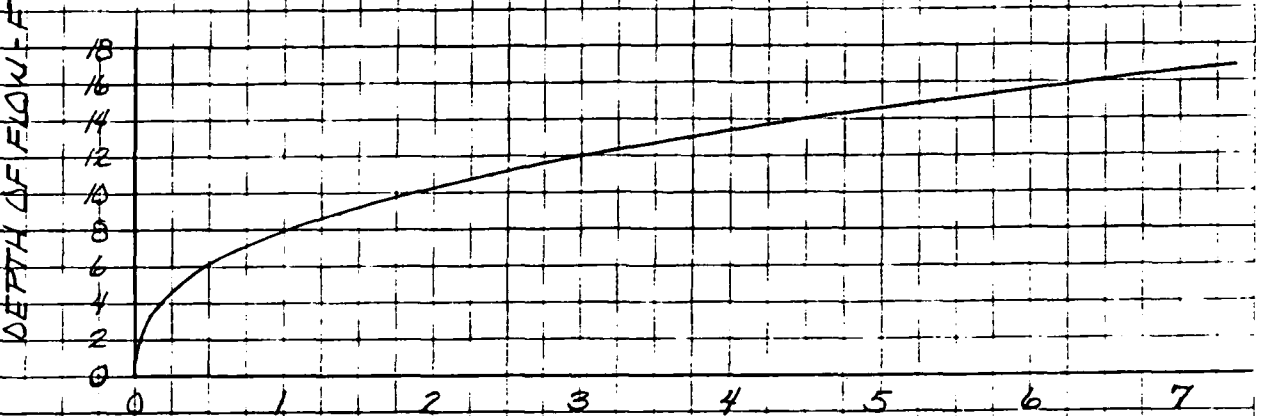
CKD BY RAH DATE 1-16-81 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 1-CE-6

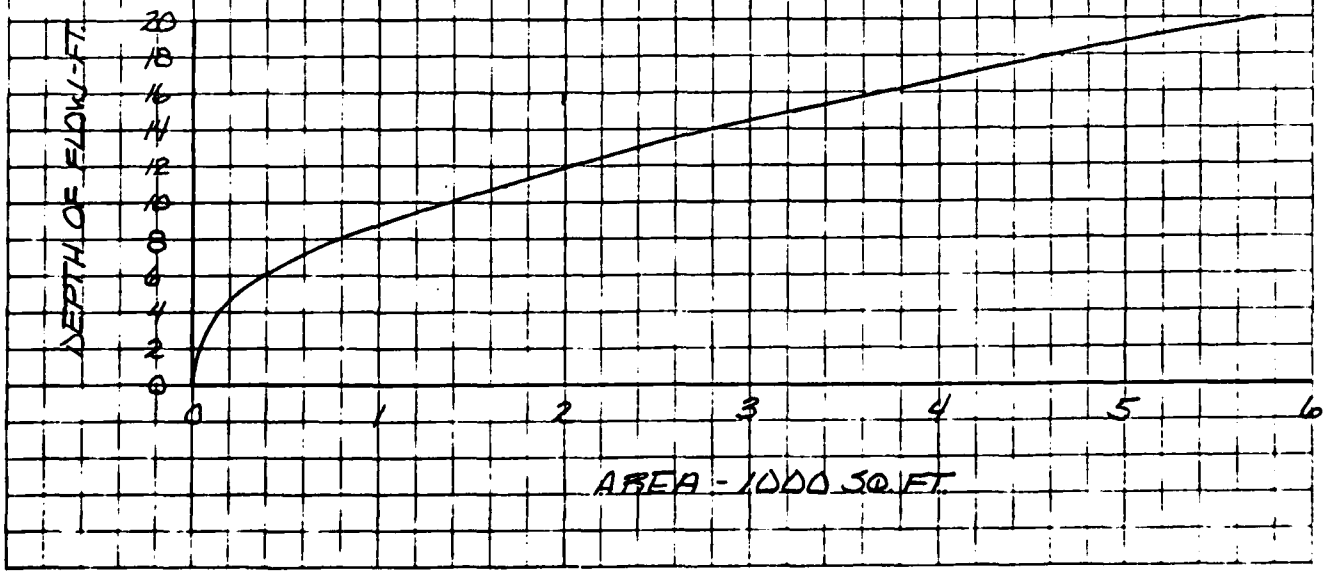
SUBJECT MOREAU BROOK DAM - FLOOD ROUTING

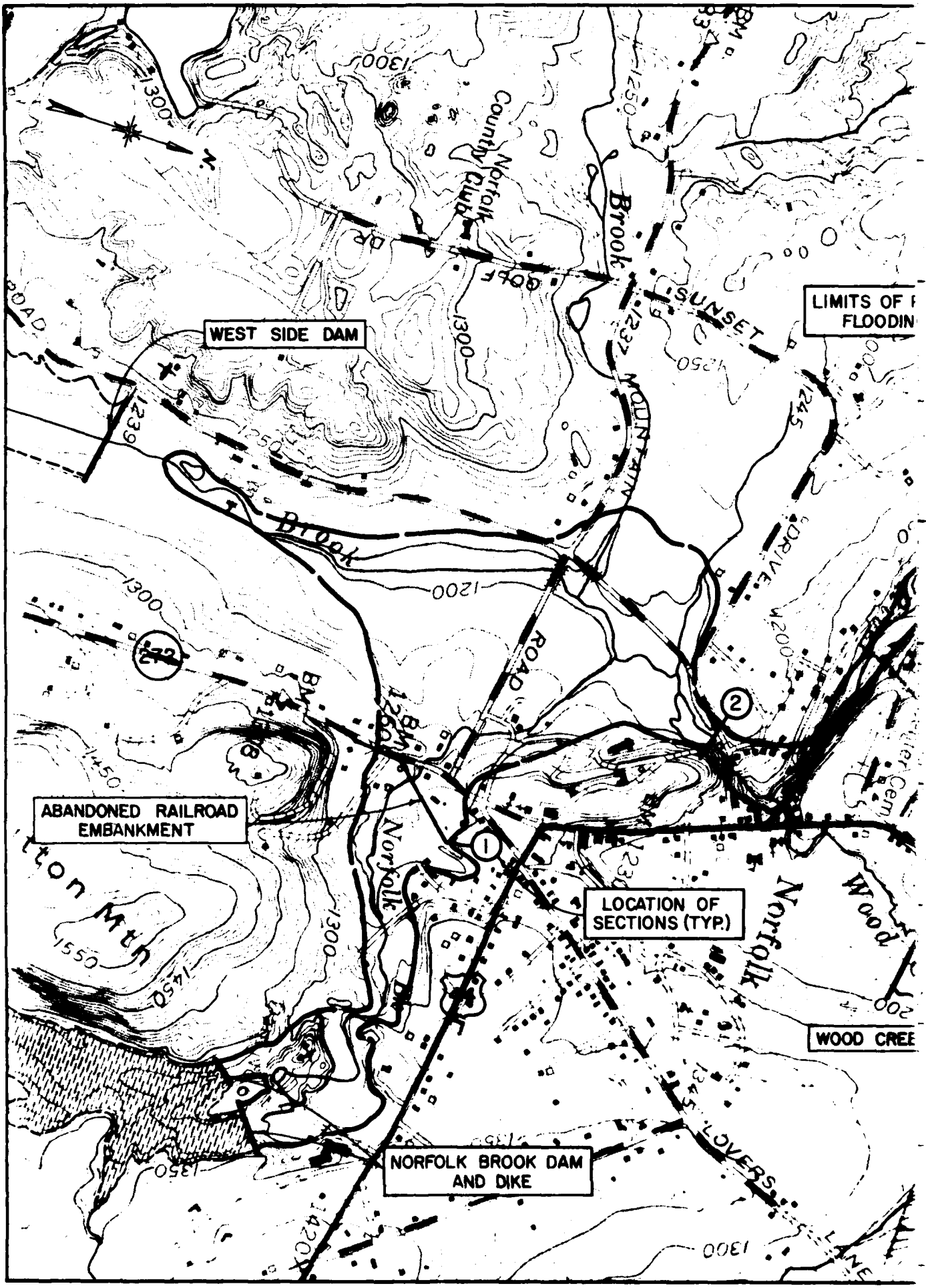
SECTION NO. 4

L = 4000'
N(A) = 0.035
(B) = 0.07
(C) = 0.1
S = 0.025








WEST SIDE DAM
ABANDONED RAILROAD EMBANKMENT
LOCATION OF SECTIONS (TYP.)
NORFOLK BROOK DAM AND DIKE
LIMITS OF F
FLOODIN
WOOD CREE
Norfolk Country Club
Brook
SUNSET
MOUNTAIN
DRIVE
ROAD
Norfolk
Wood
LOVERS
LANE
1300
1200
1250
1450
1550
1350
1400
1239
1237
1245
1200
1250
1300
1300
1300

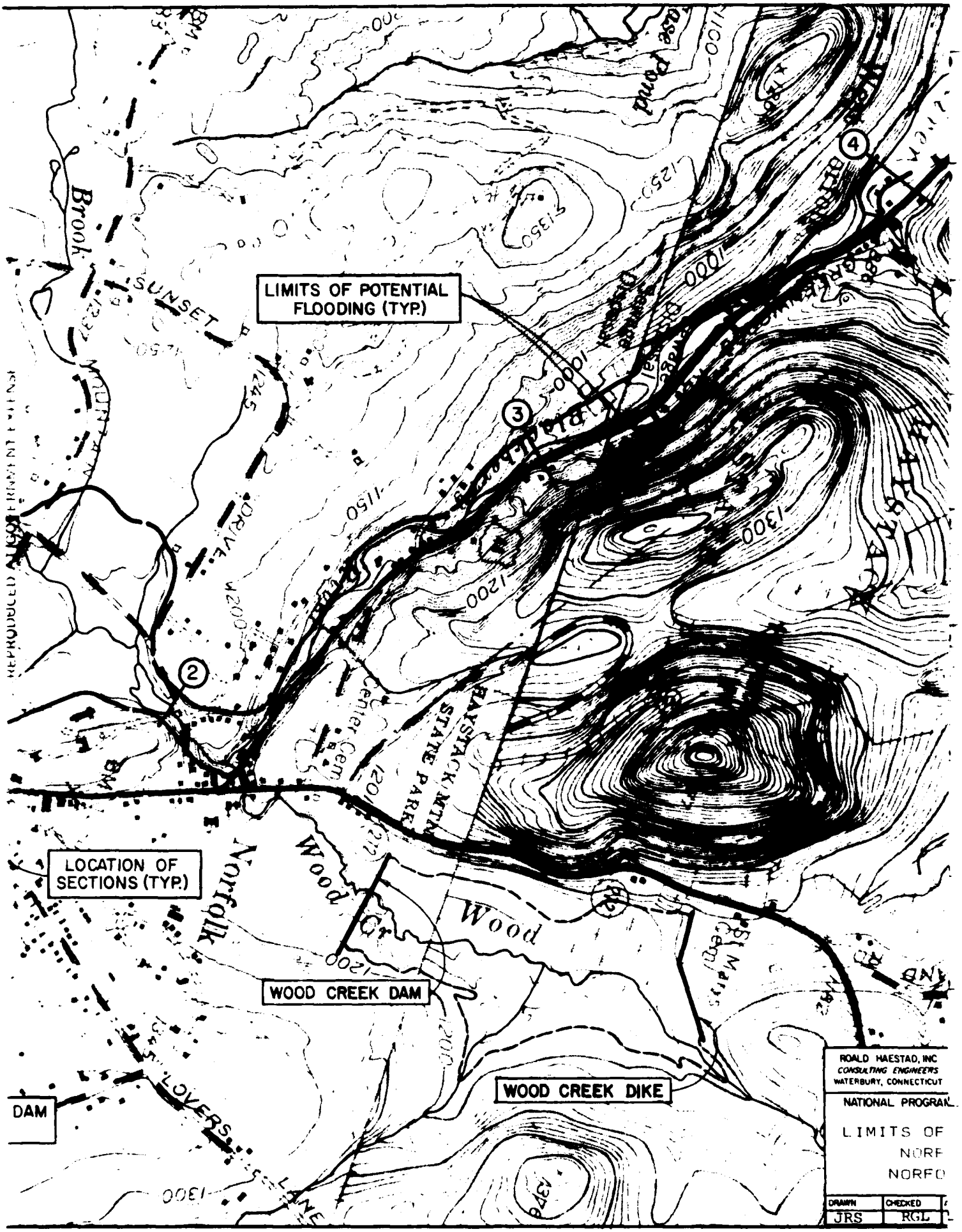
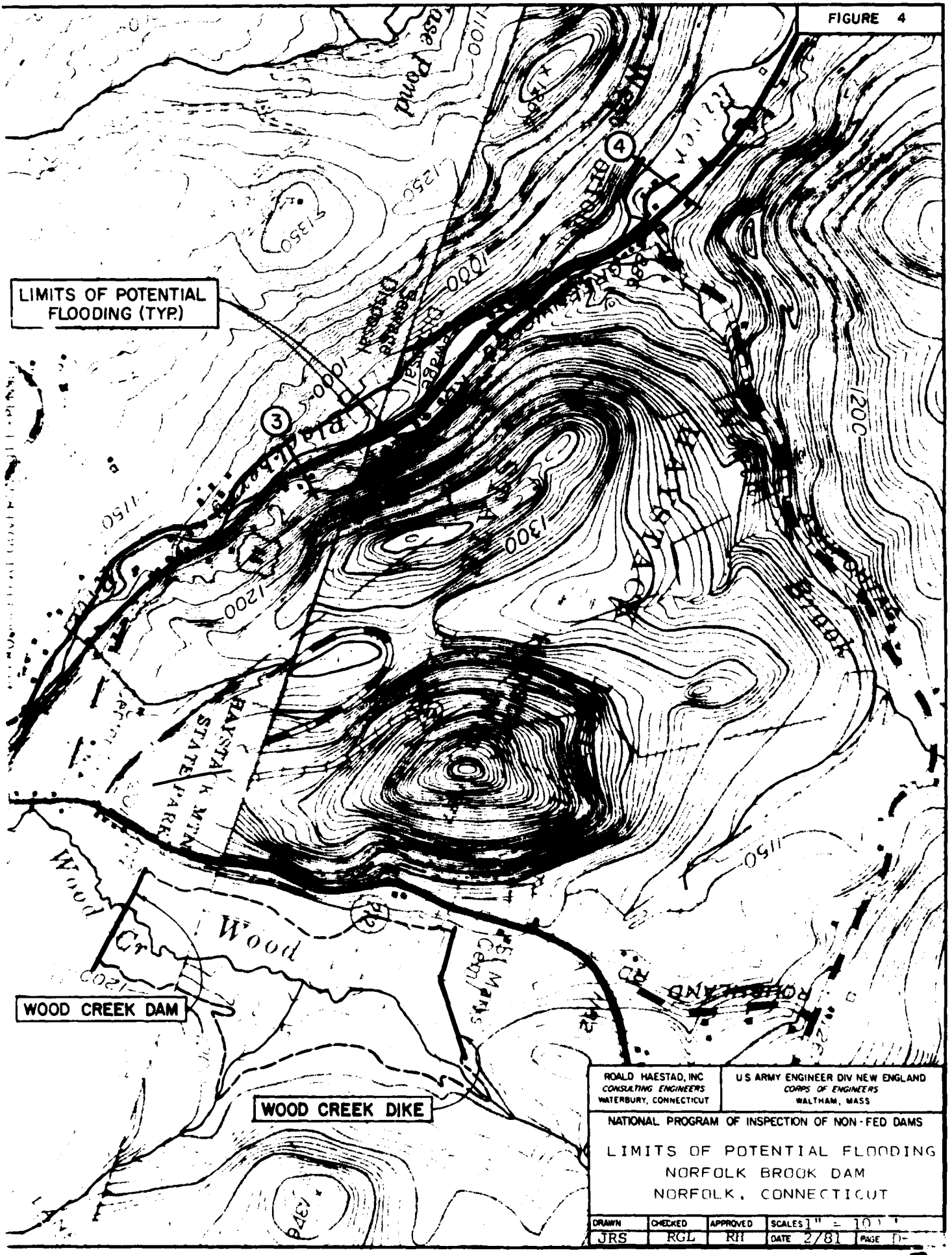

LIMITS OF POTENTIAL FLOODING (TYP.)
LOCATION OF SECTIONS (TYP.)
WOOD CREEK DAM
WOOD CREEK DIKE
DAM
Wood Cr
Wood
Norfolk
Brook
SUNSET
BAYSTACK MTN. STATE PARK
Cedar Cem.
Pond
ROALD HAESTAD, INC
CONSULTING ENGINEERS
WATERBURY, CONNECTICUT
NATIONAL PROGRAM
LIMITS OF
NORF
NORFO
DRAWN
JRS
CHECKED
RGL

FIGURE 4



ROALD HAESTAD, INC *CONSULTING ENGINEERS* WATERBURY, CONNECTICUT	U S ARMY ENGINEER DIV NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LIMITS OF POTENTIAL FLOODING
NORFOLK BROOK DAM
NORFOLK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES	DATE	PAGE
JRS	RGL	RH	1" = 100'	2/81	D-3

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

FILMED

10-84

DTIC